1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

The territory of Ladák is one of the most elevated regions of the earth. Its different valleys lie along the head-waters of the Indus, the Sutluj, and the Chenáb; and the joint effects of elevation and of isolation amidst snowy mountains produce perhaps the most singular climate in the known world. Burning heat by day is succeeded by piercing cold at night, and everything is parched by the extreme dryness of the air. The rarefied atmosphere offers but little impediment to the sun's rays, which during a short summer are sufficiently powerful to ripen barley at an elevation of 15,000 feet, although the temperature falls below the freezing point every night. This climate is equally favourable to animal life. The plains between 16,000 and 17,000 feet are covered with wild horses and hares and immense flocks of domestic goats and sheep; and the slopes of the hills up to 19,000 feet abound with marmots and Alpine hares. Such is the extreme dryness of the atmosphere, that no rain falls and but little snow, and both meats and fruits are cured by mere exposure to the air.

2.—BOUNDARIES AND EXTENT.

Ladák is the most westerly country occupied by the Tibetan race who profess the Buddhist faith. On the north it is divided by the Kárákoram mountains from the Chinese district of Kotan. To the east and south-east are the Chinese districts of Rudok and Chumurti; and to the south are the districts of Lahul and Spiti, now attached to British India, but formerly belonging to Ladák. To the west lie Kashmir and Balti, the former separated by the western Himalaya, and the

1; Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

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the west of Zanskar, on the high road between Kashmir and Lé. To *Purik* belong the villages of the Waka and Phugal rivers, from their sources in the transverse range of Singgé Lá to Kargyil, below their junction. The principal places in Purik are Mulbil, Paskyum, and Sod, each of which once had a petty chief of its own. *Suru* also owned a petty chief who lived at Lung Kartse, the principal place in the valley. The river is sometimes called by this name, but more generally by that of Suru. The Suru river joins the Waka-chu immediately below Kargyil. *Dras* is the most westerly of these small [103] districts. Its Tibetan name of Hem-babs (snow-fed or snow descended) is descriptive of its most striking peculiarity, as the most snowy district of Ladák. [132] It owes this peculiarity to the great depression in the Himálaya, at the head of the Dras river, which allows the constantly humid vapours of Kashmir to pass to the north of the mountains, where they become condensed by the cold, and are precipitated in rain or snow, according to the season of the year. These small districts extend in length from the frontier of Balti to Zanskar, a distance of 84 miles, and in breadth from the head of the Suru valley to the Photo-la, a distance of 50 miles. The area is 4,200 square miles, and the mean height of the inhabited parts, as determined by the elevation of thirteen camps, is 11,196 feet.

*Spiti** is bounded on the north by Rukchu, on the

Hem being the Sanscrit *Hima*, which has long been naturalized in Tibet. See Csoma's Tibetan Dictionary, *in voce*.

* *Spi-ti*. In Kullu and Kanáwar this district is generally called Piti, but the proper name is Spiti.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

west by Lahul and Kullu, on the south by Kanáwar, and on the east by the Chinese district of Chumurti. It comprises the whole valley of the Spiti river, from its source to the junction of the Para, a length of about 64 miles. Its mean length is not more than 52 miles, and its mean breadth only 36 miles, which give an area of about 1,900 square miles. The mean elevation of the inhabited parts, as determined by the heights of eight camps, is 12,986 feet.

Lahul (or Lho-yul, the "southern district") is bounded on the north by Zanskar and Rukchu, on the west by Káshtwár, on the south by Chamba and Kullu, and on the east by Spiti. It comprises the valleys of the Chandra and Bhaga rivers, as well as that of the Chandra-Bhaga or united stream as far as Treloknáth, below which the people are of Hindu race and religion, with but little admixture of Tibetan blood. With the single exception of the valley of the Indus, Lahul possesses more cultivable land, and a less rigorous climate than any of the other districts of Ladák. There the currant and the gooseberry are both found wild, and in the lower parts of the valley towards Treloknáth the mountain slopes are covered with fir trees. Like Kanáwar, Lahul partakes somewhat of the climate and productions of India as well as of those of Tibet. The people, their language, and their dwellings are mostly Tibetan, but with a strong mixture of Indian origin. Lahul is 68 miles in length by 34 in breadth, which give an area of 2,312 square miles. The mean elevation of its inhabited parts, as determined by the heights of nine camps, is 11,063 feet.

The following table of the extent and mean elevation

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

133 it will also be seen that the western, as well as the eastern chain, separates the great Hindu family of India from [144] the Botis of Tibet. Some mixed races are found to the south of each chain: the Láhulis and Kanáwaris to the [132] west, and the Gorkhas and Bhutánis to the east. Lastly, it will be seen that both ranges form the lines of demarcation between the cold and dry climate of Tibet, with its dearth of trees, and the warm and humid climate of India, with its luxuriance of vegetable productions. These facts, joined to the great elevation of the range, are, I think, sufficient to warrant the selection of the Bara-Lacha chain as the continuation of the true Himálaya. But there is one marked difference between the eastern and western ranges which can scarcely fail in striking the most casual observer. The inferior mountains of the eastern chain generally run at right angles to its axis, whereas those of the western chain are mostly disposed in subordinate parallel ranges. The general parallelism of the principal mountain-ranges of the world,—of the Himálayas and the Altai, in Asia,—of the Atlas, in Africa,—and of the Alps and Apennines, the Pyrenees and Carpathians, in Europe,—has already been noticed by Humboldt and others. But this parallelism also exists in the subordinate ranges of the western Himálaya. Thus we find no less than two distinct and independent ranges to the south of the western Himálaya, both stretching in the same general direction from south-east to north-west. These ranges I propose to call the *Mid-Himálaya*, and the *Outer*, or *Sub-Himálaya*, leaving the name of Sewálik unchanged for the lowermost sandstone ranges.

Beyond the Himálaya the same system of parallel chains will be observed in at least three distinct ranges

[1 of the Himalayas - ANALYST.]

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

Vigne* was informed by the Yarkandi merchants that "the snow does not remain upon Kárákoram for the greater part of the year." But my informants, who were also Yarkandi merchants, stated exactly the reverse; and we know that Izzet Ullah, in the beginning of November, found snow and ice the whole way over the pass. It is always difficult to ascertain the snow limit from the information of travellers and merchants, who, though they generally discriminate sporadic falls of snow, yet very rarely make any distinction between beds of snow sheltered in ravines, and the mass of exposed snow on the mountains that braves the noon-day heat of a whole summer. I believe that the Kárákoram Pass is rarely, if ever, entirely free from snow, although at no period of the year does the snow accumulate upon it in any great mass. There was of course much snow on the pass when Dr. Thomson ascended it in July 1848, and it was lying much lower on the northern than on the southern face. The probability is that the Kárákoram Pass has about the same elevation as the snow-line of the range, and this would at once account for the discrepancies of the different authorities. I would therefore fix a height of 18,500 feet as the snow limit on the southern face, and of 18,000 feet or even less, for the northern face.† For the snow-line, which in Rukchu is about 20,000 feet, has already begun to descend, and in the Pamer range to the north of the Kárákoram has been estimated by Wood at rather more than 17,000 feet.‡

In the Shayok and Nubra valleys, the prevailing rock is limestone.§ Granite occurs in the ridge between the

* Kashmir, II. p. 364.
† See Plate I.
‡ Wood's Oxus, p. 364.
§ Izzet Ullah, Dr. Thomson.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

Rongdo on the south, and Ruthog, Nubra, Shigar, and Hunza-Nager on the north. 133 [13]

This range has been often crossed by Europeans, but always on the same high roads, which generally lead over the lowest and easiest passes. We have the heights of six of these passes in different parts of the range. [487]

	Passes.	Feet.	Authority.
1	Tsaka-la	15,000	Trebeck.
2	Kongta-la	15,495	Moorcroft, MS.
3	Chang-la	18,105	Ditto do.
4	Lazgung or Sabu-lá ...	17,666	Dr. Thomson.
5	Lé Pass	17,600	Ditto.
6	Hanu Pass	16,890	Col. Bates.
	Mean height	16,792 or 16,800 feet.	

As the average height of these passes approaches 17,000 feet, the general elevation of the range may be estimated at not less than 20,000 feet. The height of the celebrated Kailás peak has been determined by Lieut. R. Strachey at 20,700 feet. A peak which I measured on one of the spurs of the range to the north of Mahé was 18,500 feet. In this part, as we may see from the heights of the Kongta-la and Tsakala Passes, the range is much depressed, but in the neighbourhood of Lé, wherever I could see the ridge, it was entirely covered with snow in the beginning of October. As the lofty passes to the northward of Lé are said to be always clear of snow at the end of summer, the snow-line on the Kailás or Mid-Tibetan range may be estimated at 19,000 feet,* or more, on the southern face; [132]

* In the Journal As. Soc. Bengal, vol. xviii. p. 302, Lieut. R. Strachey estimates the snow-line on the southern face of Kailás at not less than 19,500 feet, which agrees with my observations. See Plate I.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

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	Passes.	Feet.	Authority.
1	Pass above Chumur ...	18,500	Capt. H. Strachey.
2	Lának	18,746	A. Cunningham.
3	Nakpo-Gonding ...	18,000	Ditto.
4	Polokonka	16,500	Ditto.
5	Thunglung	17,500	Ditto.
6	Kandu Lá	16,600	Moorcroft.
7	Pangache Lá	16,495	Dr. Thomson.
8	Singgé Lá	16,952	Ditto.
	Mean height	17,911 feet.	

The Western half of the range beyond the valley of Zanskar becomes gradually lower and lower until it sinks suddenly into the Indus at the precipitous defile of Makpon-i-Shang-Rong. The following are the heights of some of the western passes.

	Passes.	Feet.	Authority.
1	Namyika	13,000	A. Cunningham.
2	Burgi Pass on Deotsu ...	15,600	Dr. Falconer.
3	Alampi Lá	15,500	Vigne corrected.
4	Sir-i-Kotul	16,000	Ditto.
5	Harpo-Lá	12,100	Col. Bates.
	Mean height	14,440 feet.	

132 133X On this half of the range the snow annually disappears, excepting on some of the loftier peaks which have not yet been measured. To the northward of Paskyum, I saw snow still lying in October 1847, but it was probably only new snow, which had been falling for some days before. I estimate the highest peak of this portion of the range at 17,000 feet. On the eastern half of the range in Rukchu and Ngári, the mean height of the

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

snow-line is about 20,000 feet. Dr. Gerard* indeed asserts that on the southward aspect the snow "has no well-defined boundary at 21,000 feet;" and further that some of the points which he measured had "an absolute height of 22,000 feet free of snow." But a very slight examination of his own data will show that his most elevated snow-line was under 21,000 feet. In the month of September for two successive years, 1846 and 1847, I found snow lying on the ridges to the east and west of the Tshomoriri Lake, which rise to an elevation of 20,000 feet. This agrees with Dr. Gerard's observation, also made in the month of September, that the snow-line on the mountains to the north of the lake rose to a height of "20,000 feet and upwards."† Above this, he says, the snow rested "in vast bodies, having a cliff of several hundred feet." As he afterwards adds, that "it had ceased to melt," 20,000 feet or upwards (or about 20,000 feet) must be taken as the snow limit, as determined by Dr. Gerard's observations for the Tshomoriri mountains. In September 1847, I found the Lának Pass (18,746 feet) perfectly bare, but the peaks to the north and south of the pass (about 19,500 feet)

* Researches, Asiatic Society of Bengal, vol. xviii. pp. 254-56. But when he wrote the first account of his travels, which was read before the Asiatic Society of Bengal, his altitude of the snow line was less lofty. I quote his own words: "The whole circumference of Lake Chimorerel is embayed by mountains, but hillward, on its north-eastern shore, the mass of elevated land rose very abruptly from the water's edge, and entered the regions of snow, which had an *uniform margin* of 19,000 feet." This was the south-western aspect. See Plate I.

† As we have already seen, by the last note, that Dr. Gerard estimated the snow-line on these mountains at only 19,000 feet, the "20,000 feet and upwards," is perhaps intended for the actual height of the mountains themselves. Mr. Agnew and myself estimated them at between 20,000 and 21,000 feet.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

had still large patches of snow upon their eastern and northern slopes. In the same month, the four peaks which I measured in the neighbourhood of Hanlé at different heights between 20,000 and 21,000 feet, and averaging 20,483 feet, were all partially covered with snow. The general height of the ridge was about 20,000 feet, and the snow was lying along nearly the whole line of crest to the west. On the eastern face it evidently descended lower, as on the Lának peaks. I estimate the snow-line of Rukchu at not more than 20,000 feet on the western and southern slopes, and at 19,500 feet, or even less, on the eastern and northern slopes.*

The great height of the snow-line on this range is caused chiefly by the radiation of heat from the elevated plains of Rukchu and Gáro, and by the reverberation of heat from the bare sides of the mountains. It is in part also due to its situation in the midst of lofty snowy mountains, which intercept the ascending vapours on all sides, and prevent the precipitation of moisture within this ice-bound region. As the mass of land rises, the snow-line recedes higher and higher, notwithstanding the increase of the latitude. This is shown clearly in Plate 1, which exhibits a section of the mountains from the southern base of the Himálaya to the northern foot of the Kárákoram. In this section the snow-line is seen to rise with the mass of land until both attain their greatest elevation in Rukchu. From this tract the snow-line descends as the country falls to the northward towards Yarkand and Kotan. But the fall is less rapid than the rise. From the eastern peaks of Kullu in latitude 31½°

* Plate I.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

to the Lának and Hanlé ranges in Rukchu, the rise of the snow-line is fully 4,000 feet, while the increase of latitude is only one degree; but from Rukchu to Pamer the increase of latitude is five degrees, while the fall of the snow-line is only 3,000 feet. We must therefore attribute the greatest part of this difference to the influence of latitude.

Of the geological structure of this range I can only speak generally. The Lának ridge consists of a core of granite nearly overlaid by clay-slate. To the west of the pass, the plain of Dongan is strewn with rolled boulders of granite for several miles. Thence to the Thung Lung Pass the higher ridges are of gneiss, and the slopes of mica and clay-slates. Throughout Zanskar from the Lachalang Pass to the Singgé-lá the chief formation is limestone, and beyond that the ridge consists of mica and clay-slates crested by granite, which is the prevailing rock on the table-land of Deotsu. Trap occurs in the volcanic district between Hanlé and the hot-springs of Puga.

V.—4th. THE WESTERN HIMÁLAYA.

The great Himálaya forms a natural boundary between India and Tibet. On the east it presents the lofty peaks of Kanchinjinga and Dhwalagiri, which rise to the vast height of more than 28,000 feet. To the westward it is less known, but the peaks that have been measured between the sources of the Sutluj and the Chenáb give an average elevation superior to that of the Andes.

The general direction of the western Himálaya is the same as that of the other chains which have just been

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

mean height of the crest of the western Himálaya, from Monomangli to the source of the Gilgit river, may be assumed at 19,000 feet.

On this range the snow-line can be determined within very narrow limits. On the three passes crossed by Lieut. R. Strachey,* each about 17,700 feet, no snow was found in September. The Lakhar Pass, 18,300 feet, and the Jayanti Pass, 18,500 feet, were also free from snow. "But the line of perpetual snow was evidently near, for though the Jayanti ridge was quite free, and some of the near peaks were clear, to perhaps upwards of 19,000 feet, yet in more sheltered situations, unbroken snow could be seen considerably below the ridge:" and Lieut. Strachey concluded "that 18,500 feet must be nearly the average height of the snow-line at that place."†

Alexander Gerard found no snow on the Kyobrang Pass (18,313 feet), even in July, and it was equally bare when visited by Jacquemont. On Porgyal, in October, the Gerards‡ found no old snow below 19,400 feet, and their station on the Chang-Razing mountain, 20,400 feet, was also clear; but as Dr. Gerard mentions a range due north, and a peak to the westward, while he is perfectly silent regarding the lofty peaks to the south, it seems certain that their station was on the northern exposure of Porgyal. I can myself vouch for its southern faces being covered with masses of snow in the end of August

* Journal Asiat. Soc. Bengal, vol. xviii. pp. 298, 299.

† See Plate I.

‡ Researches Asiat. Soc. Bengal, vol. xviii. p. 254. The name of Por-Gyal is written *Spor-rGyal*, the "lofty twins," the double Peak of Por-Gyal being compared to the constellation Gemini (*rGyal*) the *s* is sometimes pronounced, just as in the name of Spiti, which is also called Piti, although it is invariably written Spiti by the Lamas.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

and beginning of September 1847, when the northern side seemed generally bare. The absence of snow on the Pyramidal Peak of Porgyal, 20,106 feet, is more to the purpose, as it is certain that the Gerards could only have seen this peak from the south and west. On crossing the Manerang Pass, on the 30th of August, Alexander Gerard found the last half mile was over the perpetual snow, which he distinguishes from the fresh covering of the former night, in which the foot sank from three to twelve inches. On descending the Pass to the north, he "travelled over the snow for a mile." On recrossing the Pass, on the 7th September, he found that "the snow had not descended above 400 feet; but the great field of ages had a new and deep covering."* The snow, therefore, remains for the whole year on the Manerang Pass.

From the Manerang Pass, Alexander Gerard observed "very distinctly the Paralasa (Bara Lácha) range, covered with snow." I estimate the height of this part of the range at 19,500 feet. On the 8th September, 1847, I found no snow on the southern face of the Parang Pass, 18,500 feet, but there was a glacier one mile and a half in length, on the northern face, on which the snow was frozen hard. Snow was lying in patches on many of the peaks, at about 19,000 feet, but chiefly on the western and southern faces. The exposed faces to the north and east were bare. In September 1846, I crossed the Bara Lácha Pass, 16,500 feet, twice; and on both occasions found it entirely free from snow. The Umási-lá, 18,123 feet, was crossed by Dr. Thomson, in June, at which time it was, of course, covered with snow: but it was not clear in October 1846, when traversed by Vazir Gusaun, the minister of the Mandi Raja. In this part

* Alexander Gerard's Tour of 1821, pp. 155-56, Calcutta edition.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

of the range, therefore, the snow limit does not exceed 18,000 feet, and is probably not more than 17,500 feet. On the Baltal Peak, 19,000 feet, close to the Seoji-lá, the snow remains throughout the year. Dayamur, or Nanga Parbat (the bare mountain) is, as its name implies, free from snow; but this is owing entirely to its precipitousness, which prevents the snow from finding any resting-place. Snow, however, does lie in the hollow between the peaks.

The following are the different heights of the snow limit on the western Himálaya.

	Snow Limit.	Height.	Authority.
1	On the Kumaun Range	18,500	Lieut. R. Strachey.
2	Pyramidal Pk. of Porgyal	20,106	A. and J. Gerard.
3	Manerang Range ...	18,000	A. Gerard.
4	Parang Range	19,000	A. Cunningham.
5	Bara Lácha to Umasi ...	17,500	Ditto.
	Mean height	18,021 feet.	

This height agrees so closely with the elevation deduced by Lieut. R. Strachey, that we may conclude, with some confidence, that the snow-line, on the southern face of the western Himálaya, is between 18,500 feet and 19,000 feet. On the northern exposure, the snow limit is somewhat higher. The Gerards, as we have seen, found the northern face of Porgyal bare, to a height of 20,400 feet. In September 1847, I observed very little snow on the northern faces of the Parang Peaks, about 19,500 feet, while in September 1846, the crest of this range, as I saw it from the banks of the Tshomoriri lake, was sheeted in snow. To the westward, as the ridge diminishes in height, with the general

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

fall of the country, the snow-line falls somewhat lower, and in the neighbourhood of the Bara-Lacha Pass is not more than 18,000 feet. The mean of these observations is 19,133 feet, or in round numbers, upwards of 19,000 feet.*

The mass of the western Himálaya, from the Sutluj to the Indus, is limestone. The ridges of Kyobrang, Parang, and Umási-Lá, are all limestone, while the sides are chiefly overlaid with clay-slate. At Seoji Lá, the formation is mica-slate, but the mass of the northern mountains of Kashmir, and the peaks of the magnificent Dayamur, are all of limestone.

VI.—5th. THE MID-HIMÁLAYA, or PIR-PANJÁL RANGE.

This chain consists of four distinct masses of mountain, which may be styled the Bisahar, the Láhul, the Pir-Panjál, and the Swát ranges. The Bisahar range is an offshoot of the western Himálaya, extending for about sixty miles, from the lofty cluster of Jamnotri peaks to the Sutluj, below Shatúl. It is continued to the north of the Sutluj by the Láhul range, which stretches to the north-west for 160 miles, to the great southward sweep of the Chenáb, in Káshtwár. Beyond this again, it is continued in the same direction by the well-known Pir-Panjál, to the great southward sweep of the Jehlam, at Mozafarábád, and across the Jehlam to the Indus, at Derband. To the west of the Indus it terminates in the Swát mountains, which extend for about seventy miles to the junction of the Swát and Panjkora rivers. This portion of the chain, though not remarkable for its height, is worthy of most particular examination, for the

* See Plate I.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

The mean of the mean heights of the peaks and passes is 12,322 feet, which agrees with the mean before deduced from the greatest elevation and greatest depression.

Of the height of the Swát range I cannot speak with any certainty. The peak of Mahában, as seen from the Yusufzai plain, at different distances between twenty-five and thirty miles, I estimated at 6,000 feet, or rather more, and the highest point in the range is probably not more than 7,000 feet.

On the Pir-Panjál and Swát ranges, the snow entirely disappears; but it remains throughout the year on the lofty ranges of Bisahar and Láhul. Of the glacial lines of the Bisahar ranges, we know but little, although the Gerards made a special excursion to most of the passes in this range for the purpose of ascertaining the snow-limit. The following passages, however, bear upon the subject and corroborate each other.

In describing the Buranda Pass (15,179 feet), which they visited in October, 1818,* the two brothers, Dr. John Gerard and Captain Alexander Gerard, state that "the eastern wall rises with a considerable inclination for 500 or 600 feet; thence starting backwards, it terminates in a crown of snow, perhaps 1,500 or 2,000 feet higher." * * * "Its western side rises to a towering summit deeply clad in snow, and corresponds with the opposite or eastern one, being about 2,000 feet in height." From these statements, we learn that both flanks of the pass were certainly bare of snow to $15,179 + 600 = 15,799$ feet, and most probably much higher; for the eastern peak is said to terminate in a "crown of snow," and the western peak in a "summit

* Tour of 1818, p. 22, Calcutta edition.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

deeply clad with snow." Now, as the height of the peaks on both sides is stated at 17,000 feet or somewhat less, we may fairly estimate the snow-line on the southern faces of the Bisahar range at about 16,000 feet.

Another passage* leads to a similar conclusion: "Tufts of moss and grass with a light soil are seen all the way to the top (of the Buranda Pass), and even rise on each side to 200 and 300 feet, while higher up on the rugged cliffs that are doomed to sustain perpetual snow, animated nature finds a habitation." The snow-limit by this account was therefore certainly as high as 15,179 + 300 = 15,479 feet, which was the boundary of vegetable life, and was no doubt somewhat higher.

Again, some days later, on the Rupin Pass, 15,460 feet, at the head of the Pabar river, Alexander Gerard† describes the strata of the range to the south of the Pabar as vertical, and that above the summit of this "mural portion," which "preserves an elevation of between 15,000 and 16,000 feet, to near Jangleg," the "rocks slant towards the summit, and upon the slope lie banks of congealed snow and ice, having a perpendicular brow of packed appearance, so much resembling blocks of marble and quartz, that I doubted for some time of their reality." This account is more explicit than any other that I have seen in Alexander Gerard's travels. From the Rupin Pass to near Jangleg, a distance of about eight miles, banks of snow lay upon the slope of the ridge, while the summit was entirely covered with packed snow. This agrees with the other statements that no exposed snow was seen below 15,500 feet; that above that line it was observed in banks or patches; and

* Tour of 1818, p. 24, Calcutta edition. † Ditto, p. 27.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

that everywhere at 17,000 feet the snow was lying in undisturbed masses.

The Rupin Pass, 15,460 feet, was crossed by Captain Herbert and Captain Patrick Gerard, on the 30th September, 1819. In his map, Herbert writes along the upper course of the Rupin river, "all snow in September;" but Patrick Gerard describes the snow which they found on their way to the Rupin Pass in detail.* "Distance from encamping-ground to large snow-bed 2¼ miles, where crossed a dangerous chasm. Steep ascent through patches of snow (half a mile), fresh and melting fast. A quarter of a mile farther on, *no snow*. To pass over snow, *soft*, knee-deep, thigh-deep, and neck-deep, 3½ miles across eternal snow." The soft knee-deep and neck-deep snow was of course freshly fallen. We have thus another independent and distinct proof that the Rupin Pass (15,460 feet) was clear of old snow on the last day of September.

These different observations of the Gerards on the Bisahar range may be taken as sufficient evidence to prove that there is no perpetual snow below 15,500 feet, and that the actual snow-limit is somewhere about 16,000 feet.

On the 17th September, 1849, I took from Simla the bearings and altitudes of several peaks and snow-lines in the Láhul range with a very good theodolite, reading to half-minutes. To test the performance of the instrument, I first took the altitude of the Sháli Peak, which gave an elevation of 9,629 feet above the sea, or six feet in excess of that determined by the trigonometrical survey. I next turned it upon the Tural Peak, which is the highest in the Dhaola Dhar or Kangra range,

* Patrick Gerard's Manuscript Journals. Tour of 1819.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

with a result equally satisfactory; the deduced altitude being 16,167 feet, or ten feet less than the mean altitude obtained from my former observations at Kangra and Nurpur. Lastly, I took the altitude of the Kotgarh peak beyond the Sutluj, to the north of Rámpur. The altitude obtained was 17,353 feet, or eighty-one feet less than Captain Herbert's elevation by trigonometrical survey. These altitudes do not of course pretend to any very great accuracy, but they may be depended upon as near approximations to the truth. Their errors will arise chiefly from the difficulty of obtaining the correct distances of points that have not yet been laid down by a regular trigonometrical survey. The following table gives the heights of the snow-lines on the Láhul range as observed from Simla.*

		Height of Pk.	Lower Edge of Snow.	
				Mean.
1	On c	19,948	17,656	
2	„ e	19,366	16,837	17,297
3	„ f	19,310	17,399	
4	„ g, Kotgrah Peak ...	17,434	15,983	
5	„ j, Obelisk Peak ...	18,062	16,179	16,034
6	„ k	17,730	15,940	
	Mean height			16,665

The difference between the heights of the snow-line is simply accounted for by the difference of position in the observed points. The first three are situated in the Kullu range, and are fully exposed to the action of the south-west monsoon, which blows direct up the valleys of the Parbati, Gomati, and Sainj rivers. The other points are situated at the intersection of the lofty trans-

* See Plate I.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

verse chain which forms the watershed between the valleys of the Byás and Sutluj rivers, and which runs in the same direction as the monsoon. In its passage along the ridge, the heat of the blast is gradually abstracted, until when it reaches the snow it is reduced to the temperature of the surrounding atmosphere.

We have thus four distinct and independent observations for the height of the southern snow-line in different parts of the Mid-Himálayan range.

		Feet.	Authority.
1	In Kumaun	16,000	Lieut. R. Strachey.
2	In S. Bisahar	16,000	The Gerards.
3	In N. Bisahar	16,034	A. Cunningham.
4	In E. Kullu	17,297	Ditto.
	Mean height	16,333 feet.*	

On the same range, but farther north, I found the Kali Debi Pass, 16,700 feet, covered with snow in July, and I was assured that the snow never disappeared from the crest of the Pass. On the whole, therefore, the mass of observations agree in fixing the snow-limit on the southern exposure of this range, at 16,000 feet and upwards.

On the northern exposure, the snow-line is probably about 17,000 feet. On crossing the Rotang Pass, in the end of August, 1846, I observed that the snow on the northern face of the Láhul range did not generally descend below 17,000 feet, although on particular peaks it was lying in masses as low as 16,500 feet. On the

* Even if we allow only 15,500 feet for the height of the snow-line in the South Bisahar range, as observed by the Gerards, the mean height of the southern exposure of the outer Himálaya will be 16,208 feet.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

Bisahar range, as we have already seen from the observations of the Gerards, the snow remains throughout the year; and as the mean height of the peaks which came under their observation, does not exceed 17,200 feet, it is certain that the northern snow-line cannot be higher than 17,000 feet. From the correspondence of these observations with my own, we may conclude that the northern snow-line of the Bisahar and Láhul ranges is somewhat under 17,000 feet.

According to Herbert, the great mass of the Bisahar range is gneiss. The same rock occurs in the Láhul range, on both flanks of the Rotang Pass: but beyond this it is succeeded by limestone, which forms the crest of the Káli Debi ridge, flanked by silicious schist on the north, and by trap on the south. Beyond this, at the Saj Pass, Dr. Thomson found mica and clay slates; and limestone at the Banahál Pass, on the Pir-Panjál. But the mass of the Pir-Panjál, according to Vigne, is basaltic.

VII.—6th. THE DHAOLA DHÁR or OUTER HIMÁLAYA.

The outer, or Sub-Himálaya, stretches from the bend of the Byâs, at Mandi, to the well-known peak of Gandgarh, on the Indus. It attains its greatest height between the Byâs and Rávi, in the precipitous range of hills called the *Dhaola Dhár*,* or White Mountain, to

* This range is called by several names in our maps; as, "*Mony Mas Kidar*," that is, *Mani-Mahes-ki-dhar*, or the mountain of the holy lake of Mani-Mahes, which, however, is not situated in this range, but beyond the Rávi. Hugel calls the range "Pálam Kidar" and "Chamba Kidar," from the names of the districts to the north and south of the range. The true name is *Dhaola*, from the Sanscrit *Dhavala*, white; and this was most probably the original name written by Abu Rih'án,

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

the north of Kangra. The general direction is from south-east to north-west, as in the other ranges, and the whole length is nearly 300 miles. The Sub-Himálaya is pierced by the Rávi, the Chenáb, the Punach, and the Jehlam rivers, which divide it into several distinct ridges.

The most easterly of these separate ridges is the Dhaola Dhár, which forms the natural boundary between Kullu and Mandi, and between Chamba and Kangra. It is about eighty miles in length, and is of sufficient height to be covered with snow for about eight months of the year. I have observed this range for four successive years, and I can state positively that the snow entirely disappears from it every year, although the crest of the ridge has an average height of 15,000 feet. In the end of November, 1846, I marched from Kangra to Nurpur, and observed these mountains daily, and they were then entirely bare of snow. On the night of the 30th November, snow fell in considerable quantities, and did not disappear until the end of the following rains. In September and October, 1848, when I was at Simla, I observed this range carefully with a telescope, and could not discover a speck of snow on any part of it. Again, on the 16th and 17th of September, 1849, before leaving Simla, and when not a patch of snow was visible with a telescope sufficiently powerful for observing the occultation of Jupiter's satellites, I took the bearing and altitudes of several peaks and passes, for the purpose of verifying the measurements which I had formerly made from Kangra and Nurpur. The following table gives the results of all these measurements.

who calls these mountains بهاتل *Bhátel*, an easy corruption of دهاول *Dhaola*. See Reinaud's "Fragments Arabes et Persans," p. 94.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

average elevation of the range by more than thirty-four feet. By striking out this one observation, the average height will be 15,054 feet.

The elevation of this range is of considerable importance in determining the long-unsettled question of the snow-line, which, on the joint authority of the great Humboldt and the learned Colebrook, had been fixed at 13,000 feet, between 30½ and 32° of latitude. Lieut. Richard Strachey,* of the Engineers, was the first to correct this error, and to determine by observation that "the height of the snow-line on the more prominent points of the southern end of the belt, may be fairly reckoned at 16,000 feet, at the very least." This conclusion is fully borne out by my own observations, one half of which were made before the publication of Lieut. Strachey's paper. The ascertained height of the Dhaola Dhár, which rises abruptly from the low plains of Kangra, 3,000 feet, to a mean elevation of 15,000 feet, and of 16,000 feet in its loftiest peaks, proves most clearly that the snow-line, in the southern Himálaya, cannot be under 16,000 feet.

The geological structure of this range is almost unknown. In 1839, when I descended the valley of the Rávi, along the northern spurs of the Dhaola Dhár, I noted that the whole of the formations, at from 3,000 to 8,000 feet, were of clay and mica slates, and mostly of a very fine description, well adapted for roofing. The crest of the ridge is, however, most probably granite and gneiss, both of which I found on crossing the Chûari

* Journal Asiat. Soc. Bengal, vol. xviii. p. 292. Since the publication of this paper, however, Alex. Keith Johnston, in his beautiful Physical Atlas, p. 16, has stated the height of the southern snow-line on the Himálaya at 15,000 feet.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

was formerly employed on the Great Trigonometrical Survey, and afterwards in the Observatory of the King of Oude. The measurements were taken above Comercolly and Pubna, and included the streams of the Jalinghi and Bhágirathi, as well as the main river. The discharge of the Ganges at this point was found to be 96,000 cubic feet, or more than three and a half times that of the Indus. The maximum discharge of the Ganges at Ghazipur, calculated from the data furnished by the Rev. R. Everest, I find to be 476,761 cubic feet, or more than double that of the Indus at its greatest height. The maximum discharge of the Ganges, at the head of the Delta, cannot therefore be estimated at less than 1,500,000 cubic feet, or just six times that of the Indus. George Prinsep* states the maximum discharge at Sikrigali, at 1,850,000 cubic feet; but my calculation, from his data, gives only 1,430,800 cubic feet. This result might have been anticipated from the much greater extent of the Himálayan chain, drained by the Ganges, and from the known greater fall of rain in the Gangetic basin. The latter cause is probably the chief one, as it is known that the annual fall of rain increases rapidly from the Jamna, eastward.

III.—THE SHAYOK RIVER.

The principal mountain tributary of the Indus is the Shayok, or Khundan river, which rises in the Kárákoram mountains, to the northward of Lé, in N. latitude 35°, and E. longitude 78°, and to the south-eastward of the Kárákoram Pass. From its source to the neighbourhood of Sassar, it makes a bold sweep of sixty miles

* Gleanings in Science, III. p. 185.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

the year, Dr. Gerard* could not find any water-mark above five feet, which he consequently fixed as the limit of fluctuation; but I doubt whether the rise and fall of the lake amount to so much as one foot. In the middle of May, Trebeck† says that it is "frozen over sufficiently to be crossed by a man;" and according to the information that I received, it is usually frozen over by the end of October. During the winter there can be no fluctuation of level, as the whole surface of the ice is protected from the sun's rays by a mass of snow about knee deep. Towards the end of May or the beginning of June the ice breaks up and melts, and by the end of July the surface of the lake attains its highest level, which from the water-marks that I saw, cannot be more than one foot above the winter level.

Thogji-Chanmo is the name of the "Salt-covered Plain,"‡ in the midst of which lies the *Tsho-Kar*, or "White Lake," or as it is called by the Hindus of Chamba and Bisahar, *Khaori-Talao*, or the Salt Lake. It is situated about thirty miles to the north-west of the Tshomoriri, in N. latitude 33° 15′, and E. longitude 77° 50′, at an elevation of 15,684 feet§ above the sea. It is extremely irregular in shape; its greatest length from east to west being about five miles, and its extreme breadth about two and a half miles. It is supplied at its south-eastern corner by a small stream ten feet broad and one foot deep, which flows slowly from a small fresh-water lake. In the middle of the south side, where a

* Researches As. Soc. Bengal, vol. xviii. p. 259.

† Moorcroft's Travels, II. p. 52.

‡ The proper name is probably *Thang-Tsha-chan-mo*, "Plain-salt-full-of."

§ Dr. Gerard, As. Res. Bengal, vol. xviii. p. 260, makes the elevation 15,500 feet.

[i.e., the lake Chomo-Riri - ANALYST.]

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

of the Wanla-chu to its junction with the Indus, below the bridge of Khallach, where it crosses the river to its right bank. From this point it ascends the Indus, past the villages of Nurla, Saspul, Bazgo, and Nyimo, to Pitak, where it leaves the river and turns to the north-east for a few miles to the city of Lé. The whole distance from Kashmir to Lé is 228 miles.

I have travelled this road myself, and I can vouch for its being one of the most excellent and most easy routes to be found throughout the Alpine Punjab. It is passable from March till November, when it is closed by the vast masses of snow that accumulate on the Kashmir side of the Scoji La, and which render the passage very dangerous, both in March and April as well as in November. The greater portion of this road which lies in Ladák was made by Zorawar Sing after the conquest of the country in 1834. The large bridge over the Indus at Khallach, as well as the smaller bridges on this road over the Wanlá, Kanji, Waká, Suru, and Dras rivers, were all built by the energetic invaders, who, knowing the value of good communications, have since kept them in excellent repair. No road can well be worse than the few marches on the Kashmirian side of the pass, which are still in the same state as described by Izzet Ullah* in 1812: "The road is difficult and rocky, so as to be impassable to a mounted traveller." This is the most frequented of all the roads into Ladák, with perhaps the single exception of the northern line from Yarkand to Lé.

The following table shows the names and distances of the stages.

* Quarterly Oriental Magazine, March 1823, p. 104.

1: Cunningham G-3 (1846-47) 1854 AJ4 W Tibetans AJ4

X.—PASSAGE OF RIVERS.

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501 The great rivers of Ladák are crossed by ferries, fords, and bridges. Fording is the most usual means of crossing both the Indus and the Shayok, in the upper parts of their sources, where their waters are widely spread and shallow. In the neighbourhood of Lé, where the Indus becomes deep and rapid, it is spanned by three bridges, and just below Lé, where the current is less rapid, people are ferried across on inflated skins. The Zanskar river is bridged in two places: and is not I believe ever fordable. In Láhul the Chandra and Bhaga rivers are both bridged; but I have seen the Chandra forded at Koksar in October, and I have been ferried across it at the same place in September. In Spiti, the Párá river is crossed by a natural bridge formed of an enormous mass of rock that has fallen across the stream; and the Spiti river itself is bridged in several places. In the winter season it is fordable in many places.

103 A ford is called *Gal* in Tibetan; and the name is applied to one of the principal branches of the Zanskar river, which is called *Sum-gal*, or the "Three Fords," because it is formed of three streams that are forded one after the other just above their junction. In the summer
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● 132 the fording of many of the streams can only be accomplished in the morning; for after ten and eleven o'clock the waters are so much increased by the melted snows that they become quite unfordable. This I have myself witnessed with the Chandra river in October, and with the Charpa river in September; and I have ascertained that it is also the case with the Spiti river.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

● 132 phenomena of nature. In the Trans-Himálayan districts of Ladák, the dry wind is nearly always southerly and westerly, both in summer and in winter. This fact was partially observed by Alexander Gerard,* who remarks, that "on peaks upwards of 20,000 (feet) and at heights of 16,000 (feet) the winds were always W. or S.W." The same fact was also noticed by my brother, Captain Joseph Cunningham, who resided for nearly a whole year, including one entire winter season of 1841-42, in the districts of Upper Kanáwár, Spiti, and Chumurti. He observed that "the winds blew almost constantly from the south or south-west, as noticed by the Gerards. A northerly wind was of rare occurrence."†

When I first observed the steadiness of the day-breeze in these regions, I was under the impression that the wind blew constantly in the same direction from the south-south-west and west, but after a few days' observation I found that the morning wind blew generally from the north-east. It then struck me that the prevailing winds alternated day and night, like the land and sea breezes on the coast of India. I was confirmed in this opinion by finding on one occasion a due northerly wind blowing about midnight, and when I afterwards began to observe the magnetical instruments, I always found a light northerly breeze from two to five in the morning, which, as the day broke, gradually took a north-easterly direction. I then observed the course and strength of the wind at half-hour intervals, and my first day's

* Kanawar, p. 62.

† Moorcroft rarely mentions the winds; but in one place he incidentally alludes to them. Speaking of the sheep-folds of Kakjung on the Indus, he says that they were "screened from the *prevailing* winds by the hills to thei *south*."—I. 440.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

observations at once convinced me that my opinion was right. I continued my observations at different places during August, September, and October, and always with the same results. Since then my opinion has been most completely substantiated by my brother's observations for one whole year in Spiti. /32

The generality of travellers get too much fatigued with their exertions by day to be able to make any observations at night; and thus the south-westerly wind, which was found to prevail during the day, was supposed to last through the night, and to be a mere continuation of the south-westerly monsoon, which blows up the valleys of the Chenáb, the Byâs, and the Sutluj. But as the day-and-night wind of Ladák blows throughout the entire year, it is clear that it must be due to some other cause; for in the intertropical regions the course of the wind is dependent upon the sun's declination, which when northerly attracts the ascending current of heated equatorial air in its own direction, thus producing a south wind. But as this stream of air, when it reaches the higher northerly latitudes, where the surface motion of the earth is less rapid, still retains its superior equatorial velocity, it gains daily more and more upon the easterly motion of the earth, until at length, when it descends to the surface, it becomes a south-westerly breeze, which blows steadily during the six months of the sun's northern declination. But when the declination becomes southerly, just the reverse of this process takes place; for the ascending current of heated air follows the sun towards the south, thus producing a northerly breeze, which, owing to the difference of rotatory velocities before mentioned, gradually becomes a north-westerly breeze, which blows steadily during the

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

● 132 six months of the sun's southern declination. These are the monsoons or seasonal winds, which depend entirely upon the sun's position in the ecliptic; the south-westerly monsoon being the summer wind, and the north-easterly monsoon the winter wind. But the alternation of the day-and-night wind throughout Ladák is constant throughout the year; and as the subject is one of some interest, I will here attempt to explain what appears to me to be the cause that generates it, and that afterwards carries it round all the points of the compass.

[133] This cause is, I believe, the great mid-day radiation of heat from the bare surface of the vastly elevated plains of Ladák and the neighbouring districts, which have a mean height of 13,000 feet above the sea. The following table shows the extent and mean elevation of these great masses of table-land.

EXTENT AND MEAN HEIGHT OF THE TIBETAN TABLE-LAND.

Districts.	Extent.		Height.	
	Sq. miles.	Total.	Sq. miles.	Mean.
Rukchu	5,580		15,634	
Gáro	6,500		15,500	
Rudok	4,800		14,500	
		16,880		15,211
Zanskár	3,080		13,154	
Spiti	2,312		12,986	
Nubra	9,216		12,763	
Ngári	9,000		12,500	
		23,608		12,851
Ladák	3,960		11,500	
Purik	4,200		11,196	
Láhul	1,872		10,535	
		10,032		11,077
	Sq. miles	50,520	Mn. height	13,026

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

Now as nearly one-half of our terrestrial atmosphere lies beneath the level of these elevated regions, the highly rarefied air offers but little check to the direct transmission of the solar rays, which are more powerful in Ladák, at a height of 15,000 feet, than in the low-lying plains of India. At Gwalior the greatest heat of the sun's rays in the hot winds of 1850 was 133°; at Simla, 7,500 feet, it was 134°; but in Rukchu, 15,500 feet, Trebeck observed a solar heat of 144°, and in the same district Gerard measured the incredible rise of 158°, which is only 27° below the boiling point of water in that district.

Towards mid-day the lower strata of the atmosphere become rapidly heated, and the rarefied air begins streaming towards the north pole, as a light southerly breeze. As the day advances, the current of air quickly increases in strength until it becomes a high wind, which blows steadily during the afternoon, with occasional gusts of great violence. In the evening it becomes fainter. The progress of this wind is well shown in the following observations made by myself with Lind's wind-gauge.

DIRECTION AND PRESSURE OF THE WIND.

Time.	Direction.	Pressure.
10h. 30m. A.M.	N.E.	faint
11 00 "	E.	very faint
11 30 "	S.	light puffs
Noon.	S.W.	0·2
12 30 P.M.	W.S.W.	0·4
1 00 "	W.S.W.	0·5
1 30 "	W.	0·8
2 00 "	W.	1·0
2 30 "	N.W.	1·2
3 00 "	W.N.W.	0·8
3 30 "	N.W.	0·8
4 00 "	N.N.W.	1·0
4 30 "	N.N.W.	0·4

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

• 132 The greatest pressure was at 2h. 30m. P.M., when the wind exerted a force of 6·25 lbs. per square foot. This is a single example of what I observed daily. The day-breeze or southerly wind always began to blow before mid-day, and continued rising and veering towards the west with frequent strong gusts until three or four o'clock in the afternoon, when it reached its greatest force, and remained steady for some time. Towards sunset it changed to the west-north-west, and gradually lessened, until at 9 P.M. it was only a gentle breeze from the north-west. At midnight there was always a light northerly wind, which became fainter towards the morning, when it often freshened into a north-easterly breeze.

The following extracts in support of my opinion are taken from my brother's journal.

1842.

Jan. 8 *from noon to* 4 P.M. a strong *southerly* wind.
5 *southerly wind after* 2 P.M.
10 *afternoon*, wind *southerly*, blowing in violent gusts.
11 after 9 A.M. wind southerly in strong gusts.
18 after 5 P.M. light snow with north wind.
19 *night*, a *light northerly wind*.
20 *morning*, a *light northerly wind*.
afternoon, *south wind* blowing in gusts.
21, 22 } *afternoon*, strong *south* wind chiefly in gusts.
23 strong wind from south and south-west.
24 a light *northerly* wind *until noon*.
28 wind in gusts from *south after* 10 A.M.
30 *northerly* wind *until* 10 A.M.
Feb. 4 *early morning*, *wind northerly*, afterwards, gusts from south.
6 *until* 10 A.M. *northerly wind*.
7, 8 } *ditto* *ditto*.
25 *afternoon*, wind *southerly*.
March 22 afternoon, wind in gusts from south.
29 ditto ditto.

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1842.

April	8	puffs of wind from south.
	12—18	ditto ditto.
		A very cloudy month.
May	14	mid-day, strong south wind.
	16, 17	noon to evening, light south wind.
	18, 19	after 9 A.M. strong southerly wind.
	21	after 10 A.M. strong southerly wind chiefly in gusts.
	24	after 11 A.M. light southerly wind chiefly in prolonged puffs.
	26 to 31	afternoon, moderate south wind.
June	1 to 4	afternoon, ditto.
	5	from 9 A.M. high southerly wind to 7 P.M.
	6 to 9	ditto ditto until dusk.
	10—12	after 10 A.M. strong south wind.
	14	after 2 P.M. light south wind.
	15	after 11 A.M. south wind.
		The same for the rest of the month.
July	1 to 31	south wind for 28 days.
August	1 to 31	south wind every day.
Sept.	1 to 30	south wind ditto.
October		no observations.
November		strong south wind.

In these observations it will be observed that whenever the morning wind is recorded it is always northerly, and that the southerly wind never rises until 9 A.M., and usually later. The constancy of the southerly wind here recorded is simply accounted for by the fact, that the valleys of the Lé and Párá rivers, where my brother's observations were made, run almost due north and south. The course of the wind was therefore influenced by the direction of the valleys. This is proved by the change of the wind at Sumra, on the Spiti river, where the direction of the valley being from east to west, my brother found the afternoon wind blowing from the east. I found the same in the Spiti valley during

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● 132 August and September, when the wind was always up the valley or easterly during the heat of the day. On the Parang river, on the contrary, the wind was south-westerly during the afternoon, but north-easterly before mid-day, both the up and down currents taking the direction of the valley. At the foot of the Lanak Pass the wind was north-easterly and unsettled until noon, after which it blew steadily from the south-west up the valley.

I have already stated that the cause of the southerly or day breeze is the intense solar heat and greatly increased radiation, which are due to the vast elevation of the mass of the table-land of Ladák and the neighbouring districts. The air, rarefied by the heat radiated from the soil, streams towards the north pole in a southerly current. As it advances, it is gradually deflected to the south-west and west by the greater rotatory velocity which it possesses; and as the evening approaches, it unites with the north wind, and becomes a north-westerly breeze. This northern or night breeze is due to the intense cold generated by the great nocturnal radiation, and which begins in the loftier snowy regions at 3 P.M. The condensed air finds an outlet to the south towards the low plains of India, and becomes a northerly current of air. At first it is deflected into a north-westerly current by its meeting with the westerly breeze of the afternoon, but as the evening grows colder, the nocturnal breeze prevails, and streams gently southward towards the plains. As it advances towards the equator, its inferior rotatory velocity causes it to be deflected gradually towards the north-east and east until the sun has again raised the southern wind, and then the gentle breeze of night becomes fainter and fainter, and dies gradually away.

1; Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

● 132 This explanation seems to me sufficient to account for the constancy of the day and night breezes of the table-land of Ladák; but the violent gusts which my brother mentions, and which I have myself experienced, are due to another cause. The lighter gusts in a single valley are most probably caused by the small eddies of wind meeting the onward current at every turn; but the violent gusts which I have felt at the Thung-Lung Pass, can only be attributed to the meeting of two strong currents of the same southerly breeze, which have been deflected during their courses into almost opposite winds. Thus, the day wind, which blows up the plain of Kyang towards the Thung-Lung Pass, is a south-westerly current, while that which blows up the Puga rivulet and over the plain of Tsho-kar towards the same point, is an easterly current. The meeting of these two strong currents blowing from opposite directions, would produce small whirlwinds and most violent gusts.

III.—RAIN AND SNOW.

The quantity of rain and snow that falls in Ladák is exceedingly small. In the more elevated districts of Rukchu, Nubra, Zanskar, and Ladák Proper, it rains, or rather drizzles, for an hour or two about three times a year.* Snow falls much oftener, but not in any quantity, and in Ladák and Rudok it is never more than six inches deep. In Rukchu, as a Lama of the Korzo Gonpa on the Tshomo-Riri Lake told me, the winter snow is never more than knee-deep, and the people reside at the monastery during the whole year.

* During Moorcroft's residence in Ladák, it rained only *ten* times in two years, and then only in very small quantities.—I. 269.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

132 Light falls of snow occur at night, even in the middle of summer, as the nocturnal temperature is generally below freezing. In the end of September, 1846, I was encamped on the bank of Tshomo-Riri Lake, in a snow-storm which lasted for twenty-two hours, but the snow was not more than six inches deep, and it disappeared during the following day. In Drás the fall of snow is so great, that by the end of November the Seoji-lá Pass into Kashmir is always closed, from which the district takes its Tibetan name of Hem-babs, or "snow-fed." In Láhul and Spiti, the snow falls to a very great depth, and in many places is doubled by accumulations of drift. The suspension-bridge at Koksar, in Láhul, is annually carried away by a mass of drift-snow, which buries it during the winter. In both these districts whole villages are occasionally snowed up for three weeks at a time; but so long as the houses stand, the people suffer but little inconvenience. In 1838, however, the village of Tunda, near Treloknáth, was overwhelmed by a mass of snow, when several houses were thrown down, and sixteen people perished. The temple of Treloknáth was half-buried, and the bed of the river was filled with snow.

Heavy showers of rain fall along the Chandra river in Láhul during July and August; but after the end of September the snow begins to fall, at first in small quantities which soon disappear; but the fall gradually increases until November, when the snow ceases to melt, and the passes are finally closed.

In Spiti the fall of snow is much less than in Láhul, its greatest depth, where not drifted, being only two feet and a half. During my brother's residence* in Spiti

* Journal Asiatic Society Bengal, XIII. p. 238.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

the snow "commenced regularly on the 27th November, and from that date until the end of February, 1842, it snowed more or less heavily, and nearly all day and night, for thirty-nine days. It was cloudy or hazy and snowing on the heights for thirty-four days, leaving twenty-one fine clear days out of ninety-four." During July and August, light showers of rain were frequent, but only one heavy fall occurred during the whole year.

IV.—TEMPERATURE.

The climate of Ladák is characterized by great extremes of heat and cold, and by excessive dryness. If the earth did not possess an atmosphere, the extremes of burning heat by day and of freezing cold by night would be unbearable. It follows, therefore, that the rarer the atmosphere becomes as one ascends above the general surface-level of the earth, so much greater will be the extremes of temperature between the day and the night. This is a general rule when the atmospheric changes are not otherwise affected by peculiar circumstances. It is thus in Ladák, and more particularly in Rukchu, where the dry and highly evaporative day breeze exhausts the little moisture held in the atmosphere, and the clear dry air becomes intensely cold by the great terrestrial radiation under a cloudless sky. In the elevated district of Rukchu it freezes almost every night during summer; but the highly rarefied atmosphere offers so slight a check to the transmission of the sun's rays, that the noon-day sun is sometimes 25° hotter than it is in any part of India. In the less lofty districts in Spiti, both the cold and the heat decrease; but in Spiti the noon-day sun is still 15°

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

132 hotter than in India, while in Ladák it is about the same. The extremes of cold are equally great, and in the more elevated districts the winters are particularly severe. In Rukchu the thermometer falls as low as +9° of Fahrenheit, even in September, and the minimum temperature of the month is only 23·5°, while the mean temperature is 42° 93′. In Spiti, during the same month, the minimum temperature is only 37° 2′, and I have seen the thermometer as low as 22°, the mean temperature being 55° 5′. Most of the travellers who have visited Rukchu have been there in September. Trebeck, it is true, traversed it alone in June, yet both Moorcroft and Dr. Gerard passed through it in September, and I have twice visited it in that month. We have, therefore, good observations for the temperature of September, while that of the rest of the year is almost unknown. But as the climate of Spiti approaches nearest to that of Rukchu, both in its extremes of temperature and in its excessive dryness, we may obtain a tolerably accurate approximation to the annual mean temperature of the latter district by a comparison with that of the other. The following table gives the result of all my brother's observations for one whole year in Spiti, with the addition of my own for the months of August and September.

TEMPERATURE OF SPITI.

——	Temperature.			Extremes.		Moisture.			Sum.
	−	+	Max.	−	+	Dry Bulb.	Wet.	Diff.	
January ..	11·7	31·0	19·18	−11	35				50
February ..	7·3	35·0	18·68	− 6	40				56
March ..	10·8	40·0	24·46	− 4	45				71
April ..	31·5	5· ·0	40·89	+26	65				84

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

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——	Temperature.			Extremes.		Moisture.			Sun.
	−	+	Max.	−	+	Dry Bulb.	Wet.	Diff.	
May	38·0	60·0	49·00	34	75				95
June	45·0	74·0	59·50	44	85				120
July	48·0	80·0	63·60	46	95·0				148
August ..	43·0	74·3	58·60	41	83·5	78·25	53·25	25	98
September ..	37·2	75·3	55·50	22	84·5	70	45	25	97·6
October ..	28·0	56·0	40·12	20	65				80
November ..	17·0	35·0	22·85	+16	50				60·5
December ..	2·5	35·7	14·35	−13	42				50·7
Mean annual temperature 38·89									

By this table it will be seen that the mean annual temperature in Spiti is just one-third less than the mean temperature of September. On applying the same rule to the September mean temperature of Rukchu, 43·08°, we obtain 28·72° for the mean annual temperature. The extreme of cold is probably between twenty and thirty degrees below zero,* and the mean temperature of the winter months cannot be more than a few degrees above zero.

For Ladák Proper, I possess observations for the months of September and October, which, when compared with the Spiti observations, would give a mean annual temperature of 39° for the valley of the Indus. The following are the observations.

——	Min.	Max.	Mean.	Extremes.	
				−	+
September ...	44·93	70·00	57·01	24·0	82·0
October ...	22·22	60·87	38·95	0	66·5

* Dr. Gerard, Asiat. Res. Bengal, vol. xviii. p. 252, supposes −20° to −25°. He observed −2° in November, but this must have been in Spiti.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

● 132 By deducting one-third from the September mean, we get 38·01° for the annual mean temperature, and by deducting one-twentieth from the October mean, we get 37·00°. The mean of these two gives 37·5° as the mean annual temperature of the valley of the Indus in Ladák.

The climate of Zanskar is like that of Spiti, and that of Nubra like that of the valley of the Indus. The climate of Láhul is similar to that of Kanáwar, but somewhat colder, as Láhul is more elevated. The mean height of Láhul is 10,535 feet, while that of Kánam, in Kanáwar, is only 9,296 feet. The following results are calculated from the observations made for two successive years by the celebrated Tibetan scholar Csoma de Kōrōs, while he was studying with a Lama in the monastery of Kánam.*

TEMPERATURE OF KANÁWAR.

	Min.	Max.	Mean.	Extremes.	
				—	—
January ...	24·87	40·00	34·00	14	
February ...	28·82	46·00	36·00	21	
March	30·04	52·37	40·49	18	
April	4 ·23	59·23	49·88	26	68
May	50·80	68·80	59·77	40	78
June	57·60	74·94	66·28	48	82
July	61·26	77·59	69·22	56	80
August ...	59·91	75·40	67·65	56	79
September ...	54·78	78·71	63·90	49	78
October ...	47·27	67·82	56·16	40	74
November ...	36·46	55·48	45·98	32	67
December ...	30·71	49·05	37·25	26	
Mean Annual temperature 52·02					

* In *Manuscript*, taken at Dr. Gerard's request; these observations are now in my possession.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

Láhul is subject to greater extremes both of heat and cold than Kanáwar. The greatest temperature observed by Csoma de Körös was only 82°, whereas I have seen the thermometer at 84° on the 2nd September in Láhul. The lowest temperature of Kanáwar in August was only 56°, but in Láhul the minimum temperature is always under 50°, and the lowest that I observed was 42°. The temperature of Láhul for several days in August was

Min.	Max.	Mean.	Extremes.	
			−	+
46·00	78·2	62·1	42	84

From the similarity of climate and of geographical position, the mean annual temperature of Láhul may be deduced from its September temperature by taking the same proportion as we find in the Kanáwar observations. This proportion will give a mean annual temperature of 47° 30′ for the inhabited parts of Láhul. The uninhabited portions of the district on the upper courses of the Chandra and Bhaga rivers partake more of the climate of Spiti.

The mean annual temperature for the whole of Ladák may be obtained approximately from the details before given. See also the detailed Meteorological Observations, Chapter XVII.

TABLE OF ANNUAL MEAN TEMPERATURE.

Districts.	Height.	Annual Temperature.
		°
Rukchu	15,634	28·72
Garo	15,500	28·62
Rudok	14,500	30·00
Zanskar	13,154	39·00
Spiti	12,986	38·89

t: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

● 132

Districts.	Height.	Annual Temperature.
Nubra	12,763	39°·00
Ngári	12,500	38·00
Ladák	11,500	37·00
Purik	11,196	42·00
Láhul	10,535	47·30
Mean	13,026	36·85

The following table shows the mean daily range of the thermometer; by which it will be seen that the difference between the temperature of day and night increases with the elevation.

DAILY RANGE OF TEMPERATURE.

Districts.	Height.	Daily Range.	Extreme Range.
Rukchu	15,634	40°·28	57°·00
Spiti	12,986	36·00	43·50
Ladák	11,500	33·00	39·75
Purik	11,196	32·50	39·50
Láhul	10,535	31·14	34·00

V.—MOISTURE.

The excessive dryness of the climate of Ladák is due chiefly to elevation, by which the air is so rarefied as to be incapable of holding much moisture in suspension. It is also partly due to the great radiation of heat from the bare soil, by which any moisture is rapidly evaporated. The dryness of the climate increases with the height, and the temperature of the dew-point is so very low, that the deposition of dew is quite unknown in the more elevated districts. The depression of the wet-bulb

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

thermometer in different districts of Ladák is shown in the following table, to which I have added for comparison the mean of one week's observations at Gwalior during the hot winds in the end of May 1850, and the mean of another week in the end of March and beginning of April, which is the more correct time for comparison. 132 ●

TABLE OF MOISTURE.

Month.	Districts.	Height.	Moisture.			Dew Point.	Greatest Dep^{n}.
			Dry.	Wet.	Dep^{n}.		
September	Rukchu	15,634	67°·5	40°·5	27°·0	18°·9	31°·0
September	Spiti	12,986	70·0	45·0	25·0	25·0	30·0
September	Ladák	11,500	65·7	42·9	22·8	24·6	23·5
October	Purik	11,196	55·8	37·2	18·6	20·5	19·7
August	Láhul	10,535	74·3	52·9	21·4	38·0	28·0
May—June	Gwalior		110·12	33·80	33·80	35·32	38·5
Mar.—Apr.	Ditto		91·75	25·83	25·83	42·68	28·75

The hottest time in India is the end of May and the beginning of June, and the hottest month in Ladák is July. The fairest comparison therefore that can be made between the dryness of the two climates is that of September in Ladák, and of the end of March and the beginning of April in India. By this comparison it will be seen, that the plains of India are less arid than the lofty table-land of Rukchu, and that their dryness is about equal to that of the Spiti valley. The most convincing proof which I can give of the excessive dryness of the climate of Rukchu is the fact, that the stock of my gun, which had been exposed to *fourteen* hot seasons in India, shrank at least one-eighth of an inch during a single month's residence in Rukchu.

1: Cunningham G-8 (1846-47) 1854 AJ4 W. Tibetans AJ4

VI.—RADIATION.

132 I have already observed that the noon-day radiation of heat from the elevated table-lands of Ladák is one of the principal causes of the great dryness of the climate. The following table exhibits the maximum radiation of solar heat at about 1 P.M. in different districts of Ladák during the months of September and October, and in the plains of India in May and June, and in March and April. The observations were taken with a black-bulb thermometer, by Newman, the instrument being invariably placed at a height of three inches above the ground, and fully exposed to the sun.

TABLE OF SOLAR RADIATION.

Month.	District.	Height.	Air.	Black Bulb.	Diff.	Greatest Diff.
September	Rukchu	15,634	65°·75	86°·75	23°·00	23°·5
September	Spiti	12,986	70·00	91·31	21·31	28·5
October	Ladák	11,500	58·54	85·33	26·79	39·5
October	Purik	11,196	55·83	73·16	17·33	25·5
May—June	Gwalior		109·87	129·66	19·46	28·75
Mar.—April	Ditto		88·37	111·40	23·37	26·25

As the climate of India during March and April is just two months removed from the hottest season of the year, a fair comparison can be made between it and the climate of Ladák during the month of September. The comparison shows that the mean noon-day radiation of solar heat throughout Ladák is about the same as it is in the plains of India.

My observations for the terrestrial radiation of Ladák were all taken during the day, as I was afraid to leave the instrument exposed on a dark night amongst loose

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

cattle. The instrument was one of Newman's register spirit thermometers, with the bulb fixed in the focus of a parabolic metallic mirror exposed to the clear northern sky. Compared with the observations taken on the plains of India for March and April, the terrestrial radiation of Ladák is extremely great. The lowest temperature observed at Gwalior was 10° below the external air, and the mean of the minima was only 6° below it. The minimum generally occurred about sunrise.

TABLE OF TERRESTRIAL RADIATION.

	Hours.	VII.	VIII.	IX.	X.	XI.	Noon.	I.	II.	III.	IV.	V.	Mean daily dep.
Pugu	Air	18	25	38·5	45·7	54	56	58	61·75	59·75	56	50·5	
	Rad. Th.	9	18	27·5	35·0	43	45	49	55	52·5	48	44	
	Diff.	9	7	11	10·7	11	11	9	6·75	7·25	8	6·5	8·84
Gya	Air			39	40	40·75	45·5	45·75	45	47			
	Rad.				31	32	36	36·5	36·5	38			
	Diff.				9	8·75	9·5	9·25	8·5	9			9·00
Lá	Air		38	46	48·5	55	56·5	58·5		60·5	57	58	
	Rad.		33	37	42	48	49	49		55	51	47	
	Diff.		5	9	6·5	7	7·5	9·5		5·5	6	11	6·80
Lá	Air		36	39	41·5	45·5	53	52·25					
	Rad.		31	32	36	40	47	47·5					
	Diff.		5	7	5·5	5·5	6	4·75					5·80
Gwalior	Air			78·5			86·25			87·75			
	Rad.			77·0			87·00			87·00			
	Diff.			1·5			0			·75			

In the lofty table-land of Ladák, the greatest depression, which usually took place at 9 A.M., was 11° lower than the temperature of the external air. This was in Rukchu; but even in Ladák Proper the depression was no less than 9°. The mean hourly depression throughout the day was 8° 92′ in Rukchu, but only 6° 30′ in Ladák.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

VII.—SUPPOSED MILDNESS OF FORMER CLIMATE.

132 Various circumstances induce me to believe that the climate of Ladák was formerly much milder and much
172 less dry than it is at present. The occurrence of vast quantities of fossil *fresh-water* shells in the sandy alluvium above the level of the present *salt-water* lakes of Ladák, proves that these lakes must once have been very extensive sheets of fresh water. In the case of the *Tsho-kar* or "White Lake," this is proved beyond all doubt, by the occurrence of fossil shells on the plain of Kyang, and in the deep gorge through which the waters of the lake once had exit into this place. As the plain itself had a gradual slope from the foot of the Thung-Lung Pass to the Sumgal River, the whole extent of this double lake can be seen by a glance at the accompanying sketch-map,* which illustrates the ancient lake system of Ladák in those parts of the country which I have visited.

133 1. The *Kyang-Tsho* formerly extended from the foot of the Thung-Lung Pass to near the source of the Sumgal River, a length of thirty-five miles. It is difficult to ascertain the mean breadth, but it must have been about five miles. This would give an area of 175 square miles.

2. The *Tsho-kar* formerly flowed into the Kyang-Tsho, and was about twenty-five miles in length by five miles in breadth. The old beach-marks are distinctly visible on the mountain-sides, both to the north and south of the lake. I traversed along the southern end of the Tsho-kar in two different directions in 1846, and in 1847 along the northern end, and through the gorge which

* See Plate VI.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

Cyclas rivicola, which is only found of very small size preserved in the interior of the larger shells.* As these mollusca do not now exist in Ladák at a greater elevation than between eleven and twelve thousand feet, it seems a probable conclusion that the country must at some former period have enjoyed a very much milder climate than that of the present day. This conclusion might indeed have been deduced from the former existence of the vast lakes which have been described. For the waters vapourized by the sun must have been condensed by the cold of night, and the plains would then have been fertilized by rain, and the mountains covered by snow. Numerous streams would have flowed down the hill-sides in all directions, and the overflowing lakes would have formed mighty rivers.

Throughout Ladák there are numbers of vast ravines, many of them 500 feet deep, and as many yards broad, which could not possibly have been formed by the scanty brooks that are now nearly lost in their meanderings from side to side of these enormous channels. In one of these vast river-beds the scanty rill of the Sum-gal now purls along at the southern end of the plain of Kyang. The sides of this channel are masses of alluvial boulders and gravel, which once formed the bed of the Kyang-Tsho. The rocky barrier, below the junction of the Sum-gal rivers, was probably worn away, gradually at first, until the plain of Kyang became almost dry: after which, on the occurrence of any sudden disruption, the waters of the Sum-gal would have rushed violently onward, cutting for themselves a deep channel in the soft bed of the lake. The Kyang-Tsho must have been

* See Plate IX. for these shells.

1: Cunningham G-3 (1846-47) 1854 A14 W Tibetans A14

MOLLUSCA.

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172 The only existing mollusk I observed in Ladák was the *Lymnæa auricularia*. In Plate IX. I have given three specimens, from Pitak and Nubra in Ladák, and from Skardo in Balti. Beside them I have placed for comparison a specimen of the same mollusk from Kashmir; and above them two extinct specimens from the old lacustrine formations on the banks of the *Thogji Chenmo* and *Pangong* salt lakes. The superior size of the Kashmir specimen is perhaps no more than might be expected from the greater mildness of the climate; but that of the extinct species is most remarkable. The largest existing specimen from Pitak measures only six-eighths of an inch in length, and rather less than five-eighths in breadth; whereas the extinct specimens are upwards of an inch in length, and more than three-quarters of an inch in breadth.

These fresh-water fossil shells are found in a fine yellow sandy clay, many feet above the present level of the salt-water lakes. When they existed, the lake of Thogji Chenmo must have been a noble sheet of fresh water, upwards of forty miles in length by about twenty miles in extreme breadth, covering the whole plain of Kyung, from the foot of the Thung-Lung Pass to the rocky glen of the Sumgyel (triple junction) River. These fossil shells are now lying in myriads in the narrow pass between the old bed of the Thogji Lake and the plain of Kyung, and they are equally numerous in the upper part of the plain of Kyung.

133
132
172 At what period these vast plains were covered with water will be an interesting subject of inquiry for the geologist; but the mind gets bewildered in trying

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

to pierce the infinite obscurity of bygone ages. One point alone seems clear; that when all these lakes existed, more moisture must have been evaporated, and more snow must have fallen as well as more rain; and the humid atmosphere would have produced a milder climate more favourable to animal and vegetable life. The hills would, perhaps, have been clothed with trees, and the still waters of the magnificent lakes would have teemed with myriads of *Lymnæa*, of which only the shells now remain. But the gradual wearing down of the water-courses, and the continual bursting of the lakes, have nearly dried up all the primeval waters of Ladák; and the consequent loss of moisture has occasioned the present general scarcity of rain and snow, and that extreme dryness of atmosphere which has caused the total dearth of trees. The only sheets of water that now exist are landlocked and salt.

A second extinct species of shell is a bivalve (*Cyclas*); but as all the specimens that have been found were preserved inside the *Lymnæa*, they are necessarily small; it is now perhaps impossible to determine exactly whether they are river or lake shells.

Fossil shells are also found in the fine clay deposits near Skardo, of which I have given a specimen in Fig. 4, Plate IX., which contains a *Planorbis* and a *Luccinea* (or perhaps a small *Lymnæa*). One specimen of the existing Planorbis of Skardo is given in Fig. 9.

DOMESTIC ANIMALS.

The domestic animals of Ladák are ponies, asses, oxen, sheep, goats, and dogs. The Argons, or mixed race of half-Kashmiris half-Botis, resident at Lé, now keep a number of common fowls, but they have only

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

fifty grains each, and the same number of ears of beardless barley, from the banks of the Tshomoriri lake, gave a return of forty-five grains each. Moorcroft, however, mentions that the Hasora wheat grown in Ladák yields from forty to seventy grains in each ear.* From these statements it is clear that not more than one-fourth of the seed can germinate. Much of it is, no doubt, eaten by the vast flocks of pigeons and chakors, which abound in Ladák; but the greater proportion, perhaps, rots. Many of the young plants must be destroyed by the night frost; for in most of the districts of Ladák it freezes almost every night, even during the month of June.

The total produce of Ladák may be ascertained approximately in the following manner. In 1847 I obtained the census and other statistical details of 142 villages in the different districts of Ladák, containing 1,890 houses, with 20,815 *kháls* of cultivable land, or just 11 *kháls* per house. As the total number of landed or paying houses† in Ladák is 18,000, the whole amount of cultivable land throughout the country may be reckoned at 198,000 kháls, or about 66,000 acres. Each khál requires 16 seers of seed, and yields about ten-fold. The total available produce for food is therefore only nine-fold, or about 28,512,000 seers, equal to 1,000,000 bushels, which, with the former population of 165,000, would not give more than 7 chittaks (14 oz.) of food to each person daily, while the average consumption is at least 8 chittaks (1 lb.). The deficiency is about 24 seers for each person; which, at the rate of 16 seers per

* Travels, I. p. 275.

† In Ladák no houses are taxed except those which have lands attached to them.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

Accordingly, in the end of the year 1840, the Vazir assembled an army of 15,000 men, and a large body of Ladákis, for the conquest of Balti. Ahmed Shah also prepared himself for the struggle, and was joined by a large party of discontented Ladákis, who, after crossing the Indus, destroyed the bridge, to delay the advance of the Dogras. Zoráwar Sing was obliged, therefore, to march down the right bank of the river, which he followed steadily for twenty-five days, receiving the submission of the chiefs of Khatakchau and Khapolor, but without finding any place where the army could be crossed. He then detached Mia Nidhân Sing, with a body of 5,000 men, by way of Shigar, to look for a road, and to collect provisions, which had now become very scarce in the Dogra camp. But the Baltis kept a good look-out, and had early intelligence of this movement. Mia Nidhân Sing was allowed to advance unmolested for about fifteen miles, when his party were surrounded and attacked by thousands, and he himself was cut off with nearly the whole of his detachment.

About 400 men only managed to find their way back to the Dogra camp with the tale of their defeat. At the same time the winter set in with a heavy fall of snow,* and as provisions were extremely scarce, the Dogra troops became so much dispirited, that their discipline was seriously affected. With an impassable river in their front, and certain starvation both from cold and hunger, whether they retreated or remained in their present position, the majority of the troops paid no attention to orders, and of the few who still obeyed, none did so with alacrity.

* Vigne, II. p. 266, states that there are occasional winters of great severity.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

its camp-followers to 6,000 men, not more than 1,000 escaped alive, and of these some 700 were prisoners of war.

The Indian soldiers of Zoráwar Sing fought under very great disadvantages. The battle-field was upwards of 15,000 feet above the sea, and the time mid-winter, when even the day temperature never rises above the freezing-point, and the intense cold of night can only be borne by people well covered with sheepskins and surrounded by fires. For several nights the Indian troops had been exposed to all the bitterness of the climate. Many had lost the use of their fingers and toes; and all were more or less frost-bitten. The only fuel procurable was the Tibetan furze, which yields much more smoke than fire; and the more reckless soldiers had actually burned the stocks of their muskets to obtain a little temporary warmth. On the last fatal day not one-half of the men could handle their arms; and when a few fled, the rush became general. But death was waiting for them all; and the Chinese gave up the pursuit to secure their prisoners and plunder the dead, well knowing that the unrelenting frost would spare no one. A few men made their way to their brethren at Takla-Khar; but that garrison was so dismayed by the defeat, that they fled precipitately, even over the snowy mountain-range, near the head of the Kali river, into the British province of Kumaon. But even in this unopposed flight one-half of the men were killed by frost, and many of the remainder lost their fingers and toes. These few, and the prisoners, form the whole number that escaped with their lives.*

* In this very month, and in the same year, 1841, the British army, of about the same strength, was destroyed at Kabul.

waist to the calf and then tight to the ankle. The women's garments are of two patterns, the one called "potdur" or "botdur" and the other "sulma." The former are wide and short, coming only down to the calf, where they are tucked inside a piece of felt worn like a gaiter. The latter are like the garments seen in India, loose from waist to knee, and then very tight and very long, lying in folds from the calf down to the ankle. Among the Buddhists of Ladák, a woman wears these garments of white patoo till she gives birth to a child, after which, she wears them of black patoo. Among the ArGHons† of Ladak, a woman wears white patoo trousers only till she is married, after which she wears black. 291 851 563 585

[14]BRICK--páoo, this is the general term; it would be understood to mean the common sun-dried brick, which is made, not of clay, but of earth without the admixture of straw or any other binding substance. "Kaktsey páoo" is red or burnt brick, made of clay. These are seldom used, for owing to scarcity of wood they are expensive, and the rainfall in Ladák is so slight, that sun-dried bricks do very well. Once in 8 or 10 years heavy rain falls, and when this happens, nearly every house in the town of Leh becomes unfit for habitation, as the sun-dried bricks can't stand wet. 333 [132]

BRICK-LAYER--rtsikspon. As a matter of fact, in Ladák, the carpenters are the brick-layers. 463

BRIDE--pakma or pakmo. A woman in Ladák may become a bride at any age after 10. The usual age, both among Buddhists and Arghons† is from 14 to 18 years. Beauty in a bride is not much sought after among the Buddhists as they think beautiful brides are apt to become troublesome wives. The best bride is she who has the most property and is the best able to look after it. See also "Wife". 581 582 563

BRIDEGROOM--These are of two classes. Pakpho is the term for "bridegroom" as understood by Europeans. His age is usually from 14 to 20 years. Although the younger brothers of a bridegroom are entitled to share their eldest brother's wife, so long as they live under the same roof, they never figure as bridegrooms, and they take no part in the marriage ceremony. 582 595 585

†[Half-caste Mohammedans--Analyst]

731 and could not be rescued. Driven by hunger, animals of prey frequently penetrated into the villages and carried off livestock wherever they could find it. The wolves and the wild dogs wrought particularly bad ravages among the villagers' sheep herds, so that the villagers scarcely dared to drive their sheep out for watering any more.

A very warm Spring brought with it the very sudden melting of the snow and great floods. The tiniest little brook was turned into a torrential stream, all the empty river beds and channels of the Ladakh wilderness were filled with water. In neighboring Domkhar, in Skyurbuchan, and in many villages along the Indus and its tributaries, torrential brooks and avalanches of mud tore away the farmers' laboriously constructed terraced fields together with the young seed. A mountain slide, caused by the melted water, dammed up the water of the powerful brook in the side valley of Domkhar, so that a large lake was formed. Two weeks later the dammed up floods had eaten their way through the dam; the water masses that hurtled down into the valley, destroyed all the best fields in the valley floor and high upon the slopes of the mountains; they tore open the bottom of the valley and carried down with them soil, stones, and large boulders, so that the floor of the valley was henceforth four to five meters lower than before; and the mills which before used to stand by the brook, now hung high above it along the wall of the valley, insofar as they had not been torn along. Two houses were carried off by the floods, and several cows, donkeys, and much small livestock perished in the inundation. Two women were also drowned as they were wading through a swollen brook.

In the early summer there were, contrary to all former experience, a great many violent thunder storms (165), such as the oldest

[132] 165. Thunder storms are rare and hardly ever violent in the high altitudes of Tibet (altitudes of over 3,000 meters). This is so because of the great dryness and minimal density of the atmosphere at these heights. For the very greatest part Tibet is a mountain wilderness. Its thin, dry atmosphere permits of only a slight formation of clouds and accumulation of electricity.

821 people could not remember ever having witnessed. In the fifth month there occurred an eclipse of the moon; the sixth month brought a total eclipse of the sun. Both astral phenomena created great agitation

6: Gazetteer G-5 (ca. 1840-1883) 1883-4 AJ4 W. Tibetans AJ4

of the mountains that bound the river, that at any day such a disaster may again occur."

The Bhága, rising on the north-west slopes of the Bára Lácha pass, has a course of 65 miles to Tándi, and an average fall of 125 feet per mile. For 30 miles, the valley resembles that of the Chandra, but in its lower part is rich in cultivation, large tracts of level and arable land lying between the mountains and the river. The banks of the stream itself are steep and rocky. It is in this valley, some five miles from Tándi, that Keylang, the principal village of Láhaul, is situated. The Chandra-Bhága, or Chenáb, after the junction of its two heads, continues to flow north-west with a fall of about 30 feet per mile, until at Tirot, 16 miles below Tándi, it passes into Chamba.

The Chandra and Bhága.

The rivers in Láhaul are crossed by means of suspension bridges of from 50 to 150 feet span, made of thick ropes of twisted birch twigs. Three ropes form the roadway, and two hand-rail ropes hang above, one on either side, and are attached to the roadway by small side ropes, fastened at intervals of a foot or two. The best of these bridges are passable for sheep and goats, and without danger if the sides are wattled in with wicker work and slabs of stone placed on the roadway. In a high wind many of them are dangerous to cross, even to a native of the country. They are called *chúgzam* in Tibetan, and *jhúlá* or *dwá* in Hindí. The proper *jhúlá* is a different kind of bridge, which is not used in Láhaul. It consists of a seat in a loop hanging from a wooden saddle, which rides on a cable of thick grass rope, and is pulled across by a gay line. *Gharárá* is another name for this kind of bridge, which you use in crossing the Satlaj, the U'l and other rivers. Of late years, on the main road from Kúlu to Léh, the Chandra and Bhága rivers have been bridged with *sanga* bridges passable by cattle and horses. The *sanga* is composed of whole trunks of pine or cedar built into embankments on either side of the river in double or triple tiers, each tier projecting further from the embankment and supported by a prop on the end of the tier below. Two long trunks rest on and connect the ends of the highest tiers on either side, and form the roadway.

Bridges in Láhaul.

The uppermost village in Rangloi is Purnia Khoksar, and in Gárá, Dárcha. Both these are about 10,800 feet above the sea; but there are higher villages lower down the valley in Gárá. For instance, Kangser (*i.e.*, the big house), where Wazír Tára Chand lives, has an elevation of 11,345 feet. Mr. Lyall estimates the average elevation of the cultivated or inhabited portion of Láhaul at a little less than 10,000 feet; while General Cunningham puts it at over 11,000. The mean temperature at Kardong in the valley of the Bhága is given in Messrs. Schlagintweit's tables as follows:—

Climate of Láhaul

March	...	...	...	46° Fahrenheit.
June	...	...	...	59° "
September	...	...	...	53° "
December	...	...	...	29° "
Year	...	...	...	44·9° "

6: Gazetteer G-5 (ca. 1840-1883) 1883-4 AJ4 W. Tibetans AJ4

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Chapter I.
The District.
Climate of Láhaul.

No better place than Kardong could have been selected to show the average temperature of the inhabited part of Láhaul, but the differences of temperature are very great. In the upper part of the Chandra valley near Khoksar, the snow lies round the villages till the end of May, whereas in the valley below the junction of the rivers, the cultivators contrive to sow and reap two crops during the spring, summer, and autumn. The air is very pure and dry. Meat once dried will keep for any number of years. There is very little sickness of any kind, and goitre appears to be unknown. The influence of the monsoons is hardly felt. In July and August there are a good many showers of rain in the lower part of Láhaul, and for a few miles on both sides of the Rohtang pass, through which low gap a few clouds contrive to steal. But, generally speaking, there is almost unbroken cloudless weather in the summer half of the year, and indeed up till January, when the heavy falls of snow usually commence. In some years some villages are completely buried in snow. Avalanches fall in spring and summer, and occasionally cause serious loss of life. Not many years ago a glacier slipped and utterly buried a village in the mouth of the Yácha valley, not a soul escaping. An old man who had gone up the mountain for some purpose a day or two before the catastrophe is reported to have said on returning that his heart misgave him that something was about to happen, as he had seen a band of strangely-dressed people dancing and holding high revel at the top of the glaciers, who must have been fairies. Of course the words of the seer were set at naught. According to Captain Harcourt, spring may be said to commence in Láhaul about the middle of April; frosts set in towards the close of September,

"though the three last months of the year are generally singularly clear and fine. By January dead winter commences, and from then till April the country is covered with snow to a depth of eight or ten feet, the villages in the higher altitudes being completely submerged." The cold even in summer is at times rendered "unendurable by bitter winds, which usually spring up after mid-day, blowing like a hurricane at 3 or 4 P.M., and only subsiding into a gentle breeze after the sun has set. The nights are invariably calm and quiet."

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Configuration of *wazírí* Spiti.

Spiti is in shape a triangle; the side which separates it from Láhaul and Kúlu to the west being formed by the Kanzám ridge and the mid-Himalaya; the opposite side which separates it from Ladákh and Chinese Tibet, by the western Himalaya; and the base which separates it from Kanáwar, by that part of the mid-Himalaya which, under the name of the Mánirang range, runs along the north side of the Satlaj. The base measures about 58 miles, and a line from base to apex about 60 miles. The Spiti river rises in the apex of the triangle, and runs down its centre till it nears the base, where it inclines to the left and goes out at the north-east corner. In the south-west corner is the Pín valley, with its river of the same name, a tributary almost as large as the Spiti itself. Pín contains some eleven villages, and these are the only villages out of the main valley on this side, as the rest of the streams which join the Spiti from the mid-Himalaya, though of considerable length, flow in

6: Gazetteer G-5 (ca. 1840-1883) 1883-4 AJ4 W. Tibetans AJ4

133 Chapter I. The District. Villages and scenery in Spiti.

formation of sandstone and lime before alluded to. The valley is similarly described by Mr. Theobald:—

"All along the course of the Spiti river are seen old river terraces or deposits of shingle and sand, reaching to a height of some 400 feet above the present river level. Behind these regular deposits, rise almost mountainous accumulations of *débris*, precipitated by frost from the abruptly scarped limestone cliffs bounding the valley. The height of this gravelly mass mainly depends on the height of the cliff at whose base it has accumulated, but not uncommonly reaches to 1,500 or 2,000 feet above the river." In the depth of the valley the soft soil of the cliffs which abut in the river-bed has been hollowed out by the action of time and water into fantastic shapes. "Out of a soil of clay and bold rock," writes Captain Harcourt, "uprise rough monument-like masses that are not a little peculiar in appearance, for they are crenelated and honey-combed all over with deep holes and apertures as if scooped out by art, supporting on their summits great boulders of stone which in all probability have kept the masses underneath from wearing altogether away."

132 Climate of Spiti.

[133]

The seasons in Spiti correspond generally with those of Láhaul; though the spring is somewhat later, and the winter of longer duration. The mean elevation of the villages is considerably higher than in Láhaul, averaging 12,000 feet or over, and rising as high as 14,000. Snow begins to fall in December, and remains on the ground until the end of April, but seldom exceeds a depth of 2½ feet, which is less than in Láhaul. The cold during the winter is very severe and is aggravated by violent and piercing winds. Slight showers of rain fall in July and August, though the district is beyond the regular influence of the monsoon; severe frosts set in before the close of September, in which month Mr. Lyall records that a stream of water he had observed at night running down a slope from a broken canal, was turned into solid ice by the morning. "The climate," he adds, "is a remarkably healthy one; excepting a few simple complaints, such as colic or rheumatism; sickness appears to be almost unknown." He saw in his sojourn in the valley no cases of goitre or crétinism, and remarks that "the muscular development of both men and women looks large and hard compared with that of the people on the south side of the Himalayas." In the summer Captain Harcourt records that the days are exceptionally hot. The mean temperature of the Upper Spiti valley is given in Messrs. Schlagintweit's tables as follows:—

[164]

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January	—	—	—	—	17°
April	—	—	—	—	35°
July	—	—	—	—	60°
Autumn	—	—	—	—	39°
Year	—	—	—	—	39·1°

137 Flora.

[13]

For an account of the flora and vegetable productions of Láhaul, reference should be made to Vol. X of the Linnean Society's Journal, which contains an excellent paper upon the subject by Dr. J. E. T. Aitchison, a Civil Surgeon on the Punjáb establishment, and late British Joint-Commissioner at Leh. The hills of Spiti are, as has been already stated, bare and devoid of forest. At the head of the valley there is a kind of bush willow which grows in the

6: Gazetteer G-5 (ca. 1840-1883) 1883-4 AJ4 W. Tibetans AJ4

Chapter IV, B. Live-Stock.

Dhár or sheep-runs of Gaddí and Kolí shepherds in Láhaul.

The Láhaulís keep only a few sheep and goats, as the snow lies too long and too deep in the winter for the flocks to live out of doors as they do in Ladákh. For a very long time, therefore, the upper ends of the main valleys, which are uninhabited, and the grounds high above the villages in the inhabited parts, have been utilized by the Gaddí shepherds of Kángra and Chamba, and the Kolí shepherds of Kúlu. The snow begins to disappear in these places about the beginning of June; the shepherds do not ordinarily enter Láhaul before the end of that month, and they leave it again early in September, by which time the frost is beginning to be biting, and the rainy season in the outer Himalayan country has come to an end. In the fine dry climate in Láhaul the sheep escape the foot rot and other diseases which constantly attack flocks kept during the rains on the southern slopes of the outer Himalayas. The sheep arrive wretchedly thin, but by the time they are ready to leave, are in splendid condition. A short fine grass of a dull bluish-green colour, called *siru*, is their favourite food; *mat* and *morár* are names of other good kinds of grasses. The goats depend very much on the leaves and twigs of the birch and bush willow. The Gaddí shepherds are much more careful and energetic shepherds than the Kolís; they may be seen herding their goats on the face of tremendous precipices; with one woollen coat and a blanket they sleep out exposed to an icy wind, and take no harm; sometimes, however, the cold drives them to creep into the huddled-up flocks and pass the night with two or three sheep on top of them for a coverlid. Their sheep are reputed strong and hardy above those of any other shepherds. People as far away as the Bhotia traders of Kumáon, buy a great many every year at high prices as beasts of burden for the trade over the great snowy range between Kumáon and Tibet. These grazing grounds or sheep-runs of foreign shepherds in Láhaul are called *dhárs* or *bans* or *nigáhrs*. A *dhár* or *ban* is often sub-divided into several *wand*, each *wand* containing enough ground to graze one full flock or *khanddh* of sheep and goats. Each *dhár* has its more or less precisely fixed boundaries, and the *wariái* or title to it, is understood to have originated in a grant from a Rája of Kúlu, or a Thákur of Láhaul. Among the Gaddís some transfers by gift or sale appear to have taken place, and in several cases the original family which obtained the grant has long ceased to use the *dhár*; but in recognition of its old title the shepherd now in possession has to halt a day on the journey back and let his sheep manure the fields of the original owner, with whose permission his occupation commenced. Whether the original owner could now turn out an old occupant of this kind is a doubtful question. The grey-beards seem to think that he could send up any number of his own sheep, but could not put in a third person to the detriment of the old occupant. The title of the Kolí shepherds to their *dhárs* is the same as that by which they hold their *nigáhrs* in Kúlu. In some few instances a *dhár* was granted to a *wazír*, or person of influence, as a personal favour; but, as a general rule, they seem to have been given to the men of certain hamlets or *phátis* collectively, though perhaps the *patta* or deed of grant contained only one man's name. There are many fine runs in the uninhabited part of the Chandra valley above *purána* Kokzar, which,

361 shoulder of mountain. Kyelang has a bazaar of a dozen or so
161 shops, a grade school, a dispensary and hospital, large administration houses, a cold spring that comes booming out of a pipe, and
• [132] narrow cobblestone streets where pack trains can barely pass. It is a delightful place in summer months, seldom getting warmer than 73 degrees.

137 The streets of Kyelang are lined with aspen and willow. The willow is the common white willow of the Old World, the one that is naturalized in parts of the eastern United States, the one that is the standard wood in England for making cricket bats, artificial limbs, and the charcoal used in the manufacture of black gunpowder. The white willows at Kyelang are old and gnarled, two to four feet thick. They have been topped for years and used for wood and so are squat and stunted. New plantings of willow shoots are wrapped in cloth or twigs for protection against the goats. On the slopes above Kyelang are scatterings of juniper (pencil cedar), reminiscent of the juniper one finds in the Steens Mountain country of southern Oregon. And here and there are a few of the willow leaf sea buckthorn—a willow-like tree of the oleaster family (*Hippophae salicifolia*). At both ends of the
[133] Bhaga canyon, as seen from Kyelang, are huge snow-capped peaks with glaciers that, during a summer day, reflect in changeable moods most of the colors of the spectrum. Kyelang, green and lush, lies like an oasis—an oasis in granite, snow, and ice.

Kyelang, the capital city of Lahul, was in charge of a Tehsildar,[1] a young, soft-spoken, pleasant Sikh by the name of Mahindar Singh Randhawa. I met him as I arrived at Kyelang in the rain; and he assured me as I dismounted my pony in front of his office that the weather was "most unusual."

197 Lahul, though a part of India, is a foreign land. The most common language is Tibetan, and yet it is somewhat different because of the Lahuli dialect. The greetings along the trail out of Manali were in Hindustani—"*Ram, ram*" or "*Namaste.*" In Lahul they became Tibetan—"*Ju Ju*" or "*Ju Le.*"

[1] [Headman--Analyst]

563 sider Lahulis inferior. A Tibetan can take a Lahuli woman for his
582 wife. But a Tibetan girl is not encouraged to marry a Lahuli man. The Lahuli man has indeed an unhappy position. The women on the south side of Rothang Pass do not covet him, partly because of his exploitation of his womenfolk, partly because there is a greater variety of food in Kulu than in Lahul. The women on the Tibetan side of the Himalayas do not want the Lahuli man because he is "inferior." Lahul is an in-between place—one from which men and women both want to escape. Perhaps that is one
533 reason for its sparse population. Perhaps that is one reason why the men have such sad and plaintive voices when they sing their folk songs.

The one I best remember—one sung for us by five male villagers of Jispa, the next village beyond Kyelang—is about the girl Angmo.

Angmo used to live with her parents when a child.
When she grew up she fell in love with a boy.
They married happily.
After marriage the girl left Lahul
And went and lived with her husband,
Forsaking her parents and brothers and sisters.•

423 These Lahuli folk have an in-between status in another respect.
221 While there are a few landed estates, the country is mostly popu-
231 lated by small farmers. The few Lahulis who own sheep and goats go north in the summer and south in the winter. The sheep one sees there in summer months come up from the Kangra for a few months' grazing in the high basins.

•/32 The rainfall in Lahul averages about twenty-three inches annually. May, June, and July are lush months. By August the ground is dried out and the grain is turning brown. By September the land is barren and dusty. October sees the passes clogged with snow. Lahul is then isolated until summer. November or

•See page 333, category 116

A Court in Lahul

December brings snow to the valleys. Thus Lahul is frozen tight most of the year. There is no place for much stock. A dzo or a cow or two is all a family has.

Even the independent farmers work land that usually is not theirs. They are largely squatters on government domain—families who have taken a likely-looking bench above a river, cleared it of rocks, and planted barley. Maybe the project prospered; more than likely it failed. And so one sees along the Chandra and the Bhaga grim outlines of old fields long forsaken. The family has moved on to another location, seeking brighter prospects.

I sat with my Sikh friend, Mahindar Singh Randhawa, the Tehsildar of Kyelang, as he held court at Jispa, fourteen miles above Kyelang. We sat in the open at a table on the edge of a stand of ancient juniper three or four feet in diameter while alpine choughs (glossy black with yellow beaks and red legs) soared overhead. Lahulis had come in from miles around for the court session. The men stood huddled around us, twisting their brimless and loosely woven wool caps. They were awed by the occasion—solemn and frightened too. This was the long arm of the law reaching out from remote Delhi to touch the lowliest of them. Their womenfolk and children had come to court with them. The women sat quietly in a circle on the perimeter of the court, knitting stockings and nursing babies. Women and children were also grim. There was no laughter in the crowd, no playfulness among the youngsters. This was the day of reckoning for their menfolk.

This court had no marshal, no court crier to announce it—no "oyez, oyez, oyez." The Tehsildar convened court by calling the names of the cases. The cases were actually *Punjab* vs. *Sonam*, *Punjab* vs. *Thundup*, *Punjab* vs. *Tsering*, etc. But this kind and warmhearted judge merely called the names of the farmers, and each replied. There were dozens of cases, and they took hours. The following is typical.

"Sonam, where is your farm?"

777 I groped for an answer, thinking fast as I stirred my soup.

"It's the glass, I guess—the way the glass is made."

The next morning, as we were packing up at Gundala, I said to Budh Ram, "Let's pack the hat." Budh Ram hesitated, looked at the sky, spoke to Tashi, stood undecided for a moment, and then slowly pushed the hat into a duffel bag.

We had been on the trail only a half hour when it started to rain. And it rained all the way to Kyelang, a steady rain with much thunder and lightning. That night as we were unpacking at Kyelang, Rahul laughingly said, "Man Das says that if you had worn the glass hat none of us would have gotten wet."

After that I wore the hat. I wore it to Jispa, where the Tehsildar held court. I wore it the next day to Patseo and Zing Zing Bar. I wore it the following day when we crossed Baralacha Pass and dropped down to Kilung, and the next day when we wound down the canyon to the Tsarap River and then climbed to Chakchu, a notch in a rugged range where we camped beside a pure, cold waterfall. On none of these days was there even a dark cloud in the sky. They were brilliant days when the sun burned fiercely—so fiercely it blistered even Rahul's nose. The glass hat is made for rain, not for sun, and I grew uncomfortably hot when I wore it hour after hour in the brilliant sunshine.

As a result, when we left Chakchu I announced in a loud voice, "I'm tired of wearing this hat. I don't care if it does rain. Into the pack it goes." And Man Das dutifully packed it away.

That morning we crossed Gongrechen Pass and La Chulung
• [132] La Pass. We were now in the heart of Ladakh, where rainfall does not average over two inches a year, where the valleys are never deeper than six inches in snow, and where precious little dew falls. And yet bad weather was making up all around us and by noon was threatening. By the time we had reached the narrow canyon that has been cut by the clear water stream that flows north off La Chulung La Pass (which means the Pass of Water and Wind), it was raining. It started as a short, spattering

12: Douglas T-3 (1951)1953 AJ4 W. Tibetans AJ4

it was there that we stopped for lunch. In this grove camel caravans were repacking for the trek downstream to Khargil. Farmers were gathered under the trees, gleaning news from the men of the caravans. Mule trains, carrying produce between the villages up and down the Indus in the manner of our locals, rested in the shade. It was cool in the shade but blistering in the sun. Though this stretch of the Indus lay over eleven thousand feet high, the daytime temperature marched well over 100 degrees; and on some days it went into the 130's. The summer heat is so great and so sustained that it brings grain to maturity in two months' time.

The trail, after crossing the Indus, divides, one fork going south along the river's edge to Spitok, Khalatse, and Khargil, the other turning north to Leh, the Khardong Pass (18,380 feet), and Yarkand, an ancient trading center of Sinkiang. We took the right fork and in four miles came to Leh. This approach to Leh is dreary and desolate. In early summer there are buttercups, columbine (called asses' sugar), and clematis in this area. Later come the vetches, lavender, bluebells, and cornflowers. There are great stands of iris, which is sometimes stacked and dried for winter fodder. These flowers bring color to the land. But by mid-August the gaiety is gone. The flush of light green from the tender spring grass has also passed. Now the slopes and nullas are dry and sear.

Monotonous browns and grays fill every stretch with desolation. Each view shows the end product of erosion. The ground has been endlessly pounded by the quick feet of goats and sheep; the protective covering of the earth has been eaten off or washed away; there is no topsoil left; every ravine tells the story of harsh runoffs of water; the fields and slopes are strewn with countless rocks, pitched up by the slow working of frost or exposed by the cutting wind that whines ceaselessly along the Indus. There is no shade, no touch of life, no bush, no scattered hummocks of the *dama* bush. There are distant snow-capped peaks to lift the heart; but there are only heat and dust and rubble underfoot.

13: Heber and Heber D-3 (1914-25) 1926 AJ4 W. Tibetans AJ4

136 migrants appear. First of all the Wagtails come (Hodgson's pied ; grey and yellow-headed), making the streams and rivulets bright with their graceful movements and undulating flight, soon to be followed by the Siberian Chiffchaff, with his monotonous " cheep, cheep, cheep, cheep," The common Redstart, too, is here now, whilst the Hoopoo calls his " Ooppoooppoopp " (the Ladaki name for him) to the farmer, giving him permission to sow his fields, unafraid of serious harm to his crops from further cold. The Cuckoo, too, makes his song heard occasionally about this time, and now one can notice the Western Blue Rock Thrush, whose coat really does look a beautiful slaty blue as he sits in the sun. Above the river, Gulls and Tern wheel and sweep, and are kept company by Swift and Martin ; on the stones by its side, the Ibisbill finds his food, whilst the royal Heron meditates solemnly by the water's edge with his neck well tucked in. So we can boast of a varied ornithology, full of interest and change.

132 We have already made so many references to climate and altitude that the reader will have gathered a fair idea of both. The extremes of the climate may be summed up in the oft-told saying that if you sit in the shade of a rock, the part of your body within the shadow freezes, while that in the sunshine boils ! The heat of summer out in the desert is intense, for the long stretches of sand and the barren glaring rocks seem both to soak up sunshine and reflect it back as it pours out of a sky which is so often cloudless. Yet in the shade of rocks and trees and in the ordinary life in and about a house, it is never oppressive, and there are few summer
241 evenings in Leh when an extra wrap is not needed. The
132 short summer from June to mid-September sees the ripening of the wheat, barley and lucerne crops, the coarse grained barley being the more important source of food, and growing up to altitudes of over 14,000 feet. In the lower warmer
317 villages the summer is longer, and a second crop may be
241 raised. All this cultivation is entirely kept alive by irrigation,

13: Heber and Heber D-3 (1914-25) 1926 AJ4 W. Tibetans AJ4

dependent on the melting of the winter snows, so that the stream from the Kardong which waters Leh is completely used up, and never reaches the Indus bed ; the average two inches of rain-fall is almost negligible. Although at such an altitude, the snowfall of Leh is also not severe, the snows exhausting themselves on the surrounding ranges, and it rarely exceeds two inches on the ground at a time. It seems to evaporate without any intermediate slushy stage and a sunny winter is quite pleasant owing to the dryness of the cold. It is even quite enjoyable to sit out-of-doors in the sunshine during the day time. Though the temperature may go down to minus ten degrees F. in mid-winter, and remain by day at about ten degrees below freezing point in a room without a fire, its dryness makes it much more bearable than a less cold, but damper climate, and for a similar reason the heat is much less oppressive than that in India, perspiration being hardly perceptible owing to swift evaporation. The spring, however, is heralded by bitter piercing winds, and often they raise little spiral hurricanes of dust seen chasing across the valley from afar, but woe if one of these " sand-devils " blows across your garden and catches up your verandah chairs in its wake or fills your room with dust.

The further effects of altitude and climate on the human beings, indigenous and foreign, who dwell in the land, need not be dealt with here, but when all is said, the flame of life on the whole burns brightly in this land of clear skies and bright sunshine.

13: Heber and Heber D-3 (1914-25) 1926 AJ4 W. Tibetans AJ4

unaccustomed to washing, but well-acquainted with smoky fires. Their long coats reach just below the knees, and are cut without shape or form of any kind. The fronts of these over-lap, and in lieu of buttons they wear a long, broad kammerband round their waists to keep their coats closed. On the lapels of these garments are broad strips of nicely-coloured flannel. The Changpas are shod with long boots reaching up to the knees, red in colour and with very thick soles. Their tents, to European eyes, seem to be just about as ridiculous as tents can be; but then the Changpa does not go into them for protection from the rain as we do, but from the wind. Although in these high uplands there is plenty of rain, for it seemed to be pouring or snowing most of the time we were up there, he considers that the wind is the worse of two evils, for in a high wind you cannot make a fire to boil your tea. He therefore makes his tent so that the wind shall find it difficult to get in, while the smoke of the fire inside shall have an easy egress. To do this he leaves the top of his canvas home absolutely open to the sky. His shelter consists merely of two sides of black cloth made from yak's hair, of which the upper two corners only are fastened together and fixed on the top of upright poles whilst the lower corners are fastened to the ground. These tents are so low that, if the Changpa wants to see what his sheep are doing, he has only to stand up and put his head and shoulders out of his "chimney" to view the landscape, when he resembles nothing more closely than a released jack-in-the-box. Inside their tents these pastoral people sleep, cook their meals, and keep their goods and chattels, while grazing around are their horses, yaks, and sheep—a simple life indeed.

Pobrang itself is a very pretty place, consisting of a long stretch of grass lying among sandy mountains with the usual snow-covered peaks behind. Through it there run many delightful rivulets in which the snow-trout are so abundant that in quite a short space of time we pulled out about sixty,

14: Asboe M-3 (no date) 1947 AJ4 W. Tibetans AJ4

FARMERS AND FARMING IN LADAKH (TIBETAN KASHMIR)

By WALTER ASBOE

AN account of the cultivation of cereals in Ladakh presupposes a climate for their growth, bearing in mind the high altitude at which these cereals can thrive. In this lofty region of 10,000 to 14,000 feet above sea-level it is amazing that anything grows at all.

The country is one vast expanse of sandy plain and deep-cut valleys formed by colossal mountains and swift-flowing rivers. Upon the great plateaux large flocks of sheep laden with wool, borax, and salt move slowly over the tawny sand, raising clouds of dust as they proceed to the wool-clearing centre at Leh, the capital of Ladakh. It is also from these elevated regions that the famous shawl wool generally known as Pashmina comes, its final destination being Kashmir. Dropping down from the arid plateaus of Rupshu to the valleys of the Indus and its tributaries, you come to the many hamlets snuggling in the shelter of great cliffs and rocky eminences, forming with the arable land around them patches of vegetation resembling an oasis in the midst of a desert of rock and sand.

The climate of Ladakh is favourable to the growth of cereals and is a useful ally to the peasant living at high altitudes and subsisting on produce cultivated in ground which looks sterile and unpromising. Very little rain falls in Ladakh owing to the precipitation in the lower hills in the region of the Zogi Pass, which peters out by the time the higher altitudes are reached. The farmer has therefore to irrigate his fields artificially from rivers, mountain torrents derived from melting glaciers and the winter accumulations of snow. He is saved from the heart-breaking frustration of the English farmer, who must contend with capricious weather which so often ruins his crops just when he is ready to reap them. In Ladakh the peasant knows that the good weather of to-day will be followed by good weather to-morrow, so that he is saved much worry and extra work.

Frost and snow or sleet begin in September and continue in different districts without intermission until the beginning of May. The minimum temperature from December until February falls to −5° to −12° F., and there is no month in the year when there is not an occasional snowfall on the summits of the mountains. The intense cold of winter is mitigated by a dry atmosphere, clear skies, and a sun which warms provided that you remain in its direct rays. The average temperature in the shade during summer is about 75° to 80°. Thus the shortness of the summer is compensated for by the powerful rays of the sun, which ripen the grain rapidly.

The various meteorological processes which combine to form a climate are, as everyone knows, generated by the sun. It is therefore not sur-

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prising that in the rarefied atmosphere of such high altitudes as in Ladakh, where there is little precipitation and the land extremely dry and sandy, the power of the sun is very great. This in turn produces the winds which blow almost constantly from the south and south-westerly directions. The winds on the highlands of Rupshu, for instance, are continuous throughout the year, and they blow with great force when there is not even a vestige of cloud. These winds are dry and extremely cold, since they blow over the glaciers and snow accumulations, so that it may be truly said that Ladakh is in the belt of "windswept Central Asia." When travelling in these regions you cannot fail to observe that when the day is cloudy the strength of the wind is not so great; sometimes, indeed, there is no wind at all, whilst it rises to a gale immediately the skies clear. This is one reason why the traveller in these elevated regions prefers to cross the high passes ranging from 13,000 to 18,000 feet when the sky is overcast. You can never be certain of weather conditions on a pass, but when bad weather is encountered it is easier to tolerate a mist or even heavy snowfall than a powerful wind, which not only impedes progress but chills you to the bone. Long exposure to such a wind, be the sun ever so bright and warm, can reduce your morale and physical energy to a point bordering on collapse.

The peasants of Ladakh are sturdy and cheerful people, inured to long exposure to the sun and wind. Their physical endurance when on their trading expeditions or when carrying heavy loads over a pass in the teeth of a howling wind or blinding blizzard is phenomenal. They contrive to raise crops as good as can be expected considering the unpromising nature of the soil coupled with the difficulties of cultivating them at extremely high altitudes.

The herd instinct, so notably developed in the Tibetans, precludes any effort on the part of the individual to increase his annual output of crops. If a peasant wishes to open up a piece of waste land or contemplates cutting a watercourse to irrigate it, he is obliged to obtain the permission of the community. His well-intentioned plans are usually frustrated by the prejudice and conservatism of the villagers. They at once obstruct him by saying that any such enterprise would interfere with the area required for the pasturage of the communal flocks. The immediate result is that any idea of agricultural progress is strangled at its birth by the tyrannical communal conscience, which is contented to remain *in statu quo* as regards agricultural pursuits.

The practice of interchange of farming implements, such as has been customary from time immemorial, and the borrowing of oxen to till the land, tend to deprive a man of his inalienable right to independence. This is mainly due to the fact that the average Tibetan is too poor to purchase his own farm implements and too indigent to support the number of cattle necessary for the proper development of his farm. The measure of a farmer's wealth is calculated by the number of his horses, sheep, goats, and oxen, as well as the size of his granary. Very little money is passed from hand to hand, labour being paid for in man-power or in grain. Many peasants who have land but not sufficient manure to enrich it sub-let part or the whole of it on the understanding that the tenant

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AGRICULTURAL METHODS IN LAHOUL, WES

90 The peasants in Western Tibet are in the main agriculturalists, though on the high plateaus of that country (14,000 to 16,000 feet above sea level), there are to be found large tribes of nomads who follow a purely pastoral occupation.

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Whilst both men and women engage in field work, it is the latter sex upon whom the burden of farming really rests. The share of agricultural pursuits which falls to the male sex consists of building walls and repairing them, sowing, ploughing, repairing watercourses, building corn stacks, and assisting at the threshing operations.

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The women on the other hand are so fully employed in the running of the farms that they have little leisure for pilgrimages to sacred

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shrines, or visits to far distant relations. The men folk in Lahoul occupy their time during the summer months in wool trading, and travelling hither and thither with merchandise.

The farm duties of the female sex are the carrying and spreading of manure on the fields in spring and autumn, harrowing or beating the clods of earth in the wake of the ploughmen, making ridges in parallel or oblique lines over the fields to render irrigation easier, placing stones, sticking stones in the ground vertically for diverting the water during the process of watering, weeding, once, when the first blades of barley or wheat appear above the ground, and again, when the ears have formed, and it is easy to pluck out the long weeds with the hands.

Irrigation, reaping, threshing, winnowing and carrying in of the crops are performed by the women, with occasional help from the men when such are available.

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In Lahoul, where the snowfall in winter is heavy, the time for beginning agricultural operations varies slightly each year, though the middle of April is usually the time when farm work is contemplated.

The various occupations of the agriculturalist

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(*c*) On a spring day [there are] three colds and three warmths
In a lifetime [there are] three happy [hours] and three unfortunate [hours].

(*d*) Misery and happiness are well balanced in man's life.

000

(*e*) *Spid nyin* is a *Compositum determinativum* formed from *spidka* and *nyima*. Also *drangsum*, *drosum*, etc., must be considered as *Composita*, which accounts for the missing articles; the termination *la* to be pronounced *a*.

539 2. (*a*) སྐྱིད་སྡུག་མི་ལ། མཛེར་པ་ཤིང་ལ།

(*b*) skyid'dug mi'la, dzer'pa shing'la.

(*c*) Fortune [comes] to man, [as] a knot to the tree.

(*d*) No man knows the cause of a knot in a tree, just so unexpectedly misery and fortune come to certain people.

000

(*e*) *Skyiddug* is *Comp. copulativum*.

539 3. (*a*) ཐིགས་པ་བསྣག་ན་རྒྱ་མཚོ་གང་།

(*b*) thigs'pa sag'na gya'thso gang'.

(*c*) If drops gather, [there is] a full ocean.

000

(*d*) *Gang*, though of verbal derivation, is often used without an article to express the adjective "full."

539 4. (*a*) ལྕི་སྤྲོའི་ནག་རང་དང་ལུག་ཁོག་ཟམ་།
སྲེལ་མདོས་མོ་ཆེ་དང་གཡག་ཁོག་ཟམ་།

(*b*) Ma'shroi nag'rang dang lug'khog zam'
slel dos'moche dang yag'khog zam'.

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(*c*) With [at the time of] the *nagrang* festival at Mashro [the heat] is as great as the body of a sheep.
With the *dosmoche* festival at Leh it is like the body of a Yak.

(*d*) From the peasant's calendar. Because the festival at Leh is celebrated several weeks after that in Mashro, it is warmer then.

000

(*e*) *Maspro* = great joy. Though in this proverb the original pronunciation of Leh = *slel* is retained, in ordinary speech *s* and *l* are dropped; final *l* shows a great inclination to disappear. Sheh, a village on the Indus, was originally spelt *shel*—crystal, because crystals are found in the surrounding hills. *Gyapo* is said instead of *gyalpo*, etc. *Slel* is supposed to have been

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(*c*) The time when the fly turns [flies] round the mouth, is the time of taking off all clothing and eating everything.

(*d*) A description of summer in the peasant's calendar.

000 (*e*) About *kha* instead of *khula* see 1 (*e*). If an *r* follows a muta, the muta is often dropped in Ladakhi, thus *rang* is said instead of *brang*; *ci* 'what' is used here in the sense of whatever.

539 8. (*a*) མཁར་རྫོང་ཡ་ཆུལ་ལྟ་ལྟ།
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312 ཆུ་སྦིའི་ལྡམ་ཆུ་ཡང་འབུད

(*b*) khar'zongi yachula lta'lta,
chu'bii ldam'chu yang bud'.

(*c*) Whilst looking at the glacier water of the Kharzong pass the gathered water of Chubi (a village) is also lost.

(*d*) take what is nearest!

(*e*) refers to the system of irrigation. Notice the re-duplication of the verb, implying a durative sense = whilst.

577 9. (*a*) ར་མའི་ཁྲོ་ལ་གོ་བ། ལུག་གི་ཁྲོ་ལ་བེ་ཡ།།
539

(*b*) ra'mā thro'a go'a, lug'gi thro'abe'a.

(*c*) In the company of goats [he says] *goa*, in the company of sheep [he says] *bea*.

(*d*) Said of a man, who has no will of his own,

000 (*e*) *Goa* and *bea* imitate the voices of goats and sheep respectively.

539 10. (*a*) དཔིད་འབད་དུས། སྟོན་སྡུ་དུས།།
132
577 (*b*) spid'bad'dus' ston'rdu'dus'.

(*c*) Spring is the time of working, autumn the time of gathering.

000 (*d*) Do everything at the proper season.

(*e*) The two sentences consist each of a three-syllabled *Comps. determ.*

539 11. (*a*) དཔིད་འབད་དུས་ལ་མ་འབད་ན། སྟོན་སྡུ་དུས་ལ་འཁྱོད་འདུག།།
132
577 (*b*) spid' baddusla mabad'na, ston'rdudusla gyod'dug.

(*c*) If you do not work in the spring working time, you will repent in the autumn gathering time.

000 (*e*) Notice the change of *s* into *r* in *rdu* = gather.

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Lahaf

neighbouring Chamba, eventually to join up with the Indus basin in the plains. The valleys formed by the Chandra and the Bhaga constitute the inhabited part of Lahul, as does also the valley of their united Chandra-Bhaga course. Running towards the north, and springing also from the Baralacha pass, from a lake between the sources of the two other rivers, is the Yunan river, which joins up with the Tsarab Chu (*Ch'hu*, "water", "river" in Tibetan) in Spiti.

This hydrographic system of the Chandra-Bhaga or upper Chenab, which constitutes Lahul, is bordered to the north by Zangskar in Kashmir, to the east by Spiti, to the south by Kulu, Bara Bangahal and Barhmor, and to the west by Chamba-Lahul. All these non-Kashmiri areas were formerly part of the Punjab (Chamba was one of its princely states), but have now all been included in the new State of Himachal Pradesh.

The entire region is a high altitude one, the ranges north and south rising to a mean elevation of 18,000 feet; the lowest point is the Rothang pass in the mid-Himalayan range, and the highest peaks are well over 21,000 feet. The Chandra-Bhaga river, later to became the Chenab, does not flow below 9,000 feet at its exit from Lahul into Chamba. Kyelang is approximately at a height of 10,000 feet.

In consequence of the altitude the climate is a cold one. The mean annual temperature in the capital is only 43.3° F. with the coldest average temperature in February (23.° F.) and the highest in July-August (61.7° F.). The rainfall is scanty, reaching only six inches during the monsoon season in India from June to September. There is more rain in the winter months due to storms of high elevation; these bring the annual rainfall at Kyelang up to 23.08 inches for the whole year. For this reason agriculture has to make use of irrigation, but as there is plenty of perennial water from glaciers and from melting snow, this is rather an advantage to cultivation.

The scenery of Lahul is one of grandeur and it is impossible not to be impressed by the towering, snow-capped peaks, the bleak upper slopes of the mountains, the green pastures dotted with flocks of sheep in the summer, the poplar groves lower down fringing the flat, terraced fields of both food and cash crops, and the small villages of closely packed houses, flat-roofed and of an earthen colour, already very like the typical architecture of Tibet. This is the scene which meets the eye when the traveller is following the river bank in one of the valleys. When these are left behind, and the colder air starts blowing down from the heights, the vegetation becomes rare, and very soon ice and snow fields are reached, even in the summer, before crossing one of the high altitude passes.

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2. LADAK

a) *Preliminary Description*

I would like to begin with a brief description of Ladak and of Leh, the setting in which my research work was carried out, before accounting for the polyandry of this region.

1. *Environment*

Ladak (often spelt Ladak*h* in English, from the Hindi, whereas in Tibetan it is *La-Dwags*),[1] is really the most westerly part of the high plateau of Tibet, today included in Kashmir as a *tehsil* or administrative sub-division of that state (see Map 5). It is limited in the north by the Karakorum mountains and the Kara Tagh, which are westerly continuations of the Kwen Lun mountains of northern Tibet; in the south, by an artificial frontier drawn along the foot of the Zangskar and main Himalayan ranges; in the east, by an equally unnatural boundary with Tibet which runs from the Karatagh south-west of the Lingzi T'hang (plain) to the Pangkong Tso, and from there, south-east, to the upper Indus valley; in the west, by the other Kashmir sub-divisions of Zangskar and Baltistan.

The area covered by the sub-division is 82,000 square miles, of which only 47,762 are cultivated. It is one of the most elevated regions of the earth, the inhabited part ranging from 9,000 feet to 14,000 feet, and even more in Rupchu, as we have just seen. It is traversed from the south-east to the north-west by the Indus river, and in the north-western part another large watercourse takes its source, the Shyok river, into which runs the Nubra. It is these valleys which constitute the fertile areas where habitation is possible, agriculture fed from river and glacier water being the mainstay of the village.

As in Lahul, and even more so here, because of the altitude everywhere, the climate is a cold one for the greater part of the year, only the brilliant tropical sun of India bringing some warmth during the day in the summer months. The rainfall is scanty but, during the winter, an appreciable amount of snow does fall. Temperatures in the inhabited parts of Ladak, that is at a mean altitude of 11,000 feet, vary between a maximum of 62° and a minimum of 23°, on average.

Trade routes through Ladak are important, and there are three prin-

[1] Another Tibetan name for Ladak is *Mar-yul (dMar-yul)*, the "red country".

1; Drew G-3 (1862-1872) 1875 AV1 Kashmir W. Tibetans AV4

fallen masses. On the south side of the valley there is first a low ridge, and then above that tower great precipices of limestone rock. The Drās River enters the valley by a gorge, flows through it 25 feet below the level of the lowest alluvial terrace, and leaves by a similar narrow rock-passage.

The barrenness of the hill-sides is caused by the absence of moisture in the air and of any but the very slightest fall of rain. The range we passed through, and which in a former chapter was described in some detail, and shown to be generally a very lofty one, intercepts the moisture, whose source is the sea, obliges it to be precipitated on the outer side, and shelters this Ladākh country from the periodical rains, cutting off the supply of moisture to such an extent that the hill-sides are not only bare of trees, but of grass as well, free from forest and without herbage.

This is the character of all the country we have now to traverse, not only as far as Leh, but all that we have left to describe; so that when not specially mentioned, it must be remembered and taken for granted that the surface of the mountains is bare rock or loose stone.

And not only is the contrast great between the look of the green-clothed, forest-clad hill-sides of Kashmir and the arid, bare, and stony mountains of this Tibetan country, but the feel of the air too is very different; here in Ladākh is a clear light-blue sky and bright sun, with a brisk keen air; it is more a climate of extremes, in that the sun's rays are powerful, being less weakened in traversing the smaller thickness of atmosphere, so powerful as to heat quickly the rocky ground exposed to them, while, from its rarity, the air both receives less heat from the sun's rays, and in the evening allows of a quick radiation from the day-heated ground, so that cold nights suddenly succeed to days that have been felt to be hot by those exposed to the sun. As compared with this Ladākh country the air even of the higher parts of Kashmir is soft and mild.

The valley of the Drās River, though generally bearing out what has just been said as to climate, has not the Tibetan characteristics in the highest degree; the gap of the Pass allows some

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moisture-bearing air and even cloud-carrying wind to come through; here occur a greater number of slight showers during the summer than in the other valleys of Ladākh; but the difference is slight as compared with the great difference between the two sides of the Pass, and is most chiefly shown in winter, when the snow lies thicker in Drās than it does farther to the east.

The passage from Bāltal to Drās, a distance of 30 miles, generally done in two long days, is, in the summer, from June onwards, a not difficult road as things go in this country; it can be passed without difficulty by horses; nor does the first fall of snow (which may happen in the end of October or in November) commonly shut the road for them; but later on, usually by some time in December, the snow has become so thick that for horses to attempt the passage is rash, and only men so hardy and persevering as some of the tribes who live about Drās, or else those who get their aid, as I have done—aid that well deserves acknowledgment and thankfulness—can hope to get over in safety. Thus—although in the winter the Drās people, by watching their opportunity and waiting for some days when necessary, will keep up communication between Kashmir and Ladākh, and even carry merchandise over on their backs—the road is not thoroughly open again, ponies cannot attempt it, till the end of May.

The first village that we come to on the eastern side of the Pass, the highest in the valley, is Matāyan, which is 16 miles short of Drās; the next is Pān Drās,* five or six miles farther on; in the more open valley of Drās itself we find numerous hamlets scattered about.

Here, as in all the countries on this side of the main range, there is nothing grown without irrigation; at Drās, barley, and the variety of it called grim, are the grains mostly cultivated, for these can ripen in the time that the short summer allows. The villages

* Without attempting myself to give a derivation of the word "Pān" in the name of this village, I must protest against the connecting of it with the Persian word *Pāīn*, lower. It will be enough if I point out that Pān Drās is higher up the valley and at a higher absolute level than Drās.

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we do not in our route to Leh follow it so far, but turn round a corner to the right, and take to the valley of the Surū River (one of about equal volume with that from Drās), passing here round a rock that the road has very imperfectly been cut in, so that in places the roadway has had to be constructed of poles lodged in projections of the cliff; these are loosely covered with slabs. In a few miles after this we come to the collection of villages which bear the name of Kargil.

At Kargil is another of the wider openings between the hills; up to this spot the granitic hills had continued—bare, rocky, and lofty; but now on the east there appear lower hills of a softer material, alternating beds of clay and sandstone. Between the Pāskim stream and the Surū River is an alluvial expanse of some square miles, a succession of terraces of alluvial gravel. These plains are uncultivated; hitherto the work necessary for bringing the water of the Pāskim stream on to the lower wide terrace, though once or twice commenced, has not been successfully accomplished; but narrow strips not very high above the two streams are watered by small canals led from them.

The villages here are about 8900 feet above the sea; partly from this somewhat less altitude as compared with Drās, and partly from the place being less in the way of the comparatively moist air that steals into this country through the Drās Pass, there is both less snow in winter and a greater force of sun and warmth in summer to help on vegetation. Here wheat flourishes as well as barley; but the great difference to be observed was the growth of many fruit-trees (chiefly mulberry and apricot), as well as willows and poplars, along the watercourses that are led over the terraced fields. Such villages as we now see are narrow strips of ground, artificially banked and levelled into still narrower terrace-fields, and backed by great rocks that with a favourable aspect reflect the heat and act almost like the walls of our fruit-gardens. They are richly carpeted with heavy-eared crops and crowded with fruit-trees, the bright greenness of whose leaves delights the eye of the traveller, who for many miles has wearied under the sameness of gazing at nothing but rock and loosened stones, and the shade

1: Drew G-3 (1862-1872) 1875 AV1 Kashmir
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subject of them wants to be treated in a technical way; a notice of these I hope to communicate to the Geological Society.

Of the inhabitants of the villages from Sanācha to Hanū I have purposely refrained from saying anything here. They have characteristics indeed of the greatest interest, but I keep back the description of these in order to bring it into connection with that of the other Dārds, for to the Dārd race the people here belong. The reader should look for the ethnological peculiarities of this tract in Chapter XVIII., under the heading "Buddhist Dārds." From the next village, Achīnathang, upwards, the people are thorough Ladākhīs in race and language.

At Achīnathang the Indus Valley begins to be rather less confined; the road along it is such that one can ride. Achīnathang itself is a neat and pretty village, on a plateau of river-alluvium 200 feet above the water. Near this place, in the pebbly alluvium formerly deposited by the river, at a height of 120 feet above it, are to be seen shallow pits, from which Baltī gold-washers had dug earth which they carried down to the water side to wash for gold. Every few miles, on each side of the river, are seen little tracts of cultivated ground. One was a continuous strip on a narrow plateau, a mile in length and but fifty yards wide. Sometimes, as at Skirbichan, is a wider expanse. Each tract has on it a collection of houses in proportion to the area, at the rate of a house to three or four acres. These white houses, half hidden by the foliage, and the spread of green fields, contrasting with the bare surrounding country, make each little village a charming sight. In this part the Ladākhīs are well grown; they are taller than those of the neighbourhood of Leh. This I connect with the somewhat milder climate and the consequently less severe life experienced.

Besides the villages which we see along the Indus Valley there are several in the side valleys which join from both right and left. At the mouth of these valleys one sees but a narrow opening; from this they often stretch up for miles, and contain cultivated land and several hamlets. Of these the higher ones endure a distinctly more severe climate than do the villages of the main VALLEY.

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361 valley. Above the cultivation the ravines lead up into rocky
133 wastes in the heart of the hills; those on the right bank lead to the watershed of the Leh Range; sometimes they lead to a more or less frequented Pass, as did the Hanū Valley, sometimes to a rocky ridge that man never reaches, for the reason that there is nothing to draw him, sometimes to ground so precipitous and impracticable that mortal foot cannot tread it.

Next above the part of the Indus we have been speaking of we come to a village mentioned two chapters back, Khalsī, the place where the road from Kashmir reaches the Indus Valley. But the route we followed in the march did not altogether keep to the valley, which now therefore remains to be spoken of. Along the valley is a succession of villages, but not a quick succession; two on a day's march are as many as one meets. Nurla and Sāspūl are the most important of those we pass; they both are near the river. Of the hills that here bound the valley, those on the right bank are not lofty; as was explained in Chapter IX., a range of secondary height intervenes before the great granite mountains are reached. On the left bank the prominent mountains are 2000 feet or so high above the valley; these are but the ends of spurs from a range that rises 6000 or 7000 feet higher, namely, to 18,000 or 19,000 feet above the sea.

Above Sāspūl the river in places flows where the road cannot follow it, in narrow inaccessible gorges. The Zānskār River, of great volume, here joins the Indus. As we approach Pitak we rise to the more open part of the valley.

132 I have described what kind of travelling it is to traverse the valley below Khalsī in summer time—toiling on foot along rough stony tracks or up rocky slopes under a powerful sun. This present part I have gone over both in summer and in winter; and, in spite of a severity of cold in the air far greater than I have ever experienced in England, I have been more comfortable on the winter journey. It was in January; the snow was falling lightly, keeping, as it fell, dry and powdery; the river was frozen in more than one place, so that we could cross, and choose which bank to go along, while near Nurla we were able to ride for a mile

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or two on the ice over the Indus itself. Thus by ice and snow the way was made smoother; lambskin coats and caps and felt stockings kept out the cold, and the best houses of the villages afforded at every stage a shelter that in that season was welcome and comfortable. 132 [485]

Nearing Leh, we find that the ranges of mountains, on opposite sides of the valley, rise to about equal height, and for a considerable distance seem equal and parallel. But each has a character of its own. The one on the south-west rises, in a direct distance of nine miles, to a ridge which is commonly 19,000 feet high; just in front of the town of Leh is a peak of 20,000 feet, which retains perpetual snow; indeed there are on the range some fields of snow with small glaciers leading down from them; the lower limit of perpetual snow here is 18,500 feet. This ridge is indented by ravines in regular succession that open to the Indus Valley; the spurs between the ravines rise, at the last, where they near the main valley, to greater heights than they have in the parts near the ridge; so there is a second line of eminences, overlooking the Indus flat; these (which are composed of strata of shale and sandstone, dipping inwards), when viewed from certain spots, appear to form a continuous ridge; but in truth they are separated from each other by the ravines, and are each joined by a neck to the range behind; looked at from the flat these heights are seen to rise along a well-marked straight line. The alternating ravines have narrow openings from which project alluvial fans, which, meeting, form a sloping stony tract between the hills and the flatter alluvium of the main river. From the foot of these mountains, across the valley, to the nearest beginning of the opposite hills, is from two to three miles. These others are of a form different. The summit line indeed of this ridge also, as has been pointed out, is 19,000 or 20,000 feet in altitude; snow and small glaciers are found at the highest parts, but on the whole the ridge has a rocky surface. The difference of form lies in the character of the spurs. Sharp-ridged spurs descend from the central ridge to the Indus Valley; though possessing some irregularity of outline they decline without any great interruption, and project in long 133

1: Drew G-8 (1862-1872) 1875 AV1 Kashmir
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flourish, and there are generally some one or two buildings of a better character than the ordinary peasant's cottage—as a monastery and a village headman's house—which brighten up the place. A character of the villages here—which those of the rest of Ladākh have not—is the enclosure of the fields with dry thorn hedges; these are necessary for a protection for them from the ponies of the travellers who pass through this country on their way to Yārkand. Another peculiarity is that a large number of the fields are laid in for grass; the letting of the pasture to the travelling merchants being a profitable business.

For equal altitudes the climate of Nubrā is nearly the same as that of Central Ladākh, except that probably the winter snowfall is, as regards the valley, somewhat less. Between each fall of snow so much of it disappears by evaporation and by the wind drifting it, that, throughout the winter, the cattle, sheep, and goats are able to graze in the low pasture grounds, only at night are they taken in under cover. Some of the villages have mountain pastures, to which the flocks are driven in summer time; but the climate is so dry that these afford but very scanty pasturage. The vegetable products are nearly the same as in Central Ladākh. The naked barley is the most general crop; wheat is grown in nearly all the villages, but not in large quantities, as the people themselves do not consume it. There is a little fruit—apples, walnuts, and apricots; of apricots the sweeter sort ripen only in the Shāyok Valley below the junction of the rivers; in this part also melon and water-melon ripen. Unmārū, a village which has a southern aspect, is the best place for fruit in Nubrā. The people of Nubrā, under the head of Ladākhī, have been described in the last chapter. There is this difference in them when compared with those of the near neighbourhood of Leh, that they are taller and thinner. The difference seems to be due to local circumstances. I could not trace it to any admixture of other blood. The characteristics of high cheek-bones and elongated eye are found in almost all. The customs of the Nubrā people, as far as I know, differ in no respect from those of the people of Central Ladākh.

1: Drew G-3 (1862-1872) 1875 AV1 Kashmir
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face of the mound. The place is dilapidated; ruin and decay are shown both in the substance of the hill—the waste of mountains—and in the human habitations that were built on it. Such instances of moraines could be multiplied. Not far from Padam is a conspicuous group of very large erratic blocks. Just south-west of Thonde, nine miles from Padam, where the valley is about a mile and a half wide, there stretches right across it—except for the channel that the river flows in—an irregular moundy tract of stones and sand. This is clearly a moraine; its width, measured in the direction of the run of the valley, is half a mile; it contains pieces of gneiss, which must have come from the mountains south-west of Padam.

The climate of Zānskār is severe. The spring, summer, and autumn together last little more than five months, after which snow falls, and at once winter closes in, confining the people and the cattle within doors for the space of half the year. A much greater depth of snow falls here than in Central Ladākh. In the spring it causes avalanches from the mountains to such an extent that in the Nunak Valley the people cannot till a month has passed get about from village to village for fear of them. To clear the snow from the fields in time for the sowing requires special contrivance. During summer and autumn the people collect earth and store it in their houses in considerable quantities. In the spring, when they deem the time of snow-fall to be over, and the snow in the fields is partly melted and has begun to cake with the sun's rays, they spread the earth, which absorbs warmth from the sun, and melts the snow in contact with it. Sometimes snow falls afresh, and the labour is lost and has to be repeated. In 1869 there were three or four layers of earth and snow thus accumulated before the work was done. The villages of Zānskār are not so comfortable nor so picturesque in look as those we have seen in other parts of Ladākh. Trees are extremely rare; the continuance of snow and the force of the wind are much against their growth; there are a few plantations of poplars grown for the sake of timber, and lately the authorities have increased their number, but the trees produce nothing more than slender poles.

1: Drew G-3 (1862-1872) 1875 AV1 Kashmir
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But to reach those parts we have to cross the Toglung Pass, of 17,500 feet elevation, which we approach by continuing up the same valley for some 14 miles more; it gradually increases in slope, but even at the end is not steep; a smooth neck of ground makes the Pass, and the hills near are themselves rounded. From the summit we obtain a view which gives us some insight into Rupshu. There is a pretty steep slope beneath us of near 1500 feet, and then a flat valley extending long to the south-east and widening, thus showing us far off, 18 miles distant, the blue waters of one of the lakes which we shall visit—the Salt Lake. The flat bottom of the valley is bounded by smooth naked hills. It is such valleys as this, varying from a mile to (rarely) six miles in width, and enclosed by mountains rising sometimes 2000 feet and sometimes as much as 5000 feet above them, that make what are called the uplands, or sometimes the table-lands, of Rupshu.

Before detailing the many interesting phenomena in physical geography which are presented to us in the various portions of this district, we will look at those circumstances which affect the peopling of it; which cause it in a certain degree to be fit as a dwelling-place for man, yet limit narrowly the number of people it can support.

RUPSHU AS INHABITED.

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With an elevation of 14,000 and 15,000 feet for the valleys, the climate is necessarily extremely severe in point of temperature; it is at the same time of an extreme dryness. The character of the summer climate of Rupshu is warmth of sun and constant coolness of the air. At midday the sun's rays are exceedingly powerful; on the decline one experiences cold, which is intensified by the biting wind that commonly springs up in the afternoon. At night, even in the height of summer, except when the sky may be overcast, water freezes; in the beginning of August I have seen ice caking the pools. The snow limit is about 20,000 feet; this great height of it is due to the dryness of the air, to the small amount of snowfall of each year, an amount so small that below that level it all becomes melted during summer. Mountains that

1: Drew G-3 (1862-1872) 1875 AV1 Kashmir
W. Tibetans Adj

rise above 20,000 feet originate glaciers; there are small ones in the hollows of several such peaks; but there is no great snowy area. The surface of the hills is chiefly disintegrated rock, and the surface of the valleys is earth or gravel. Vegetation is extremely scant; here and there is some green by a spring or along the moistened bank of a stream, and on some hill-sides is a thin herbage. It is this herbage that is the support of the flocks and herds which sustain the small population of Rupshu. Cultivation is carried on in two places only, and to a very small extent; it is on their flocks that the people depend.

In the whole area of the district, which is about 4000 square miles in extent, there are but 500 souls.* These, as will have been understood, are Chāmpās; they are dwellers in tents, or, as the Persian phrase has it, "wearers of tents."† This small tribe, the Rupshu Chāmpās, have about 100 tents, one to a family; they are divided into two camps, which separate in summer, and frequent distinct pastures, but reunite in winter. They make about four moves during the year, with, I think, much regularity, though the time of these must vary if the season be unusually late or early; thus their stay at each encamping-ground is nearly three months on the average. The tents are of a black hair-cloth, made from either yāks' or goats' hair. They are of a peculiar form; they are constructed in two pieces, which are not closely united, but put together so as to leave an opening of six inches all along the top; this allows the exit of smoke, while the fall of rain or snow is so small as to cause little inconvenience, or the space may be temporarily covered with a piece of carpeting. The space within the tents is enlarged by the hair-cloth being pulled out here and there by extra ropes, which are led over a forked stick and then pegged down. The tent is ornamented with little flags and with yāks' tails fastened to the poles. I have no measurement, but from memory should say that the tents are about 14 feet long, 10 feet wide, and nearly 6 feet

OF THESE LIVES A WHOLE FAMILY.

* These people practise polyandry as the Ladākhīs do; to this we must directly attribute their small numbers. The necessity felt for polyandry arose from the number of sheep, goats, &c., being limited by the winter feed.

† *Khima-posh.*

1: Drew G-3 (1862-1872) 1875 AV1 Kashmir
W. Tibetans A14

361 The summer encampment is not close to Karzok, but it is made two
321 or three miles up the side valley; at that distance up the ravine widens out, and on a stony expanse, through which a stream flowed watering a narrow green strip, were about fifty black tents of the Chāmpās, and a few white ones of merchants from Kulū, who had come to trade with them; this was the encampment of that half of the Rupshu tribe which keeps to the south-eastern pastures. The flocks were spread over the hills, seeking for the scarce herbage.

241 Karzok is one of the two or three places in Rupshu where there is cultivation; here some 12 acres are sown with naked barley. Close upon 15,000 feet, it is the highest cultivation that I know of. When I was there the crop was thriving, but in some years it fails of ripening. The land is irrigated from the stream of the side valley, that which made the delta before spoken of, which is one of the chief affluents to the lake.

132 The climate of this part is thoroughly Tibetan. Snow falls in winter, but not to a great depth. In summer the air is usually clear and cloudless. The year I was at Tsomoriri, however, 1871, was an exceptional one all over Ladākh, and rain fell in showers such as had seldom been seen, accompanied by thunder. In these storms we saw the mountains in colours different from those native ones which the glaring sun had brought out so strongly. Before, the lofty hills, except where whitened by a capping of snow, had shown nothing but rocks and stony or earthy slopes of brown and grey, the distant ones seeming close from the rarity and clearness of the air. But now, with the clouds overhead and the storms filling the valley, the recesses of the purpled mountains seemed more distant; yet we saw deeper and deeper into them as the various shades showed out the successive spurs and ridges, and the water of the lake formed a bright belt in front of the richly-tinted hills.

TSO KYAGHAR.

133* North of Karzok a high ridge of mountains edges Tsomoriri on the west, having high cliffs in its upper part and sloping more

1: Drew G-3 (1862-1872) 1875 AV1 Kashmir
W. Tibetans A14

361 Now after passing over several miles of these stony tracts, we come to where there are two or three small villages, which are the highest in the Indus Valley. This bit of the valley is properly out of Rupshu, still it is traversed by the Chāmpās in going from one part of their district to another. The villages are three. On the left bank is Nidar, in a ravine that comes down from the south; it has three houses only. On the right bank are Nimū, of twelve [241] houses, and Mad, of ten. Nimū is about 14,000 feet above the sea; it shows a tract of bright green at the edge of a great stony expanse; naked barley and peas are sown here, but only the [137] former ripens. Of trees there are a few large willows of great age. I have two or three times noticed that in the villages near the upper limit of trees, where few grow, there are some of more than usual size; this probably is from more respect being paid to, more care taken of them; there is also a newly-made plantation of [132] willows. At Nimū little snow falls, and what comes does not stay long on the plain; in winter the cattle and the flocks graze on the [101] plain by the river, but are brought under cover at night. The people of Nimū are not Chāmpās, but are nearer the Ladākhīs [221] both in look and language; they are, however, to some extent nomadic, since some of them take their flocks to other pastures in winter and live in tents while tending them. The village of Mad is in the next ravine to the east.

133* Leaving these last villages we follow up the valley of the Indus. It has widened to a plain, some four miles across, sandy at the outer portions, but covered with pasture about where the river flows through it. There are some small isolated rocky hills projecting up in the plain. This extends to where the river makes a sudden bend to the north-east.

Here we must pause to look more widely at the physical geography of the neighbourhood.

Cunningham, in his book on Ladākh, speaks of the "Kailas Range" as extending in one unbroken chain from the source of the Indus to the junction of the Shāyok, the name being taken from a peak on it near Mānsarāwar Lake (which is far to the south-east of the country we are dealing with), and he calls the great ridge behind Leh, between the Indus and the Shāyok, by

1: Drew G-3 (1862-1872) 1875 AV1 Kashmir
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foundation soil of the whole is exposed on the surface or is strewn over or covered with stones. It is indeed "a weary waste, expanding to the skies." /33X

If, from upon this plain, we survey the mountains around, we see that on the south, the side we have come from, it is bounded by low-sloping hills. On the west come bolder hills and even snowy peaks; in these there is a gap, to follow which would lead one down to the river Shāyok. All along the north of the plain is the range of the Lokzhung Mountains, whose direction is west-north-west and east-south-east; this begins on the west with two peaks between 20,000 and 21,000 feet, and continues at from 18,000 to 19,000 feet, a range of irregular hills, steep, rocky, and peaked. To the east-south-east the plain at first seems boundless, but again, from some points, summits of mountains become visible, which probably belong to an enclosing ridge.

The climate of this high plain is one of almost daily extremes. The sun may rise in a clear sky, and, as it climbs, warm the ground with a speed proportioned to the thinness of the air that the rays have to pass through, increasing its warmth till two or three hours past noon; the air being still, the lowermost layer of it becomes somewhat raised in temperature, but the traveller feels chiefly the double effect of the direct rays and the radiation from below, and he labours over the desert plain oppressed by the heat. When the sun has declined but half-way to the horizon, there springs up a wind from the south-west or west-south-west, a keen and searching wind, that quickly makes one suffer from cold more than before one did from the heat. So it continues till nightfall, then gradually the wind dies away; in the still night the ground loses its heat, and a severe frost occurs by morning. On the 26th August 12°, and on the 11th September 10° Fahr. were the temperatures recorded by my minimum thermometer. This, I think, is the usual course in summer time, but, exceptionally, cloud, or a storm of wind, comes on that tends to lower the day and perhaps to raise the night temperature. One cannot tell to what depth snow falls on this plain in winter; I have never heard of anyone having traversed it at that season, /33X /32

1: Drew G-3 (1862-1872) 1875 AV1 Kashmir
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but I saw it white with snow on the 12th September; the whole plain was covered with snow, while of the bounding mountains the lower slopes were of the brown colour of their own rocks, their summits only being whitened by the fresh fall; but at that time of year such a fall would be sure to melt. The winter's snow certainly stays on the hills till summer is well on. The streams which the melting snow supplies are apt to dry up by the middle of August; in crossing the plain at that time, and again in September, I found but a few pools of water in one of the chief stream-courses; of these one was brackish and one fresh. One day I was on the look out, as the goal of the day's march, for the salt lake marked in Mr. Johnson's map. Several times a mirage deceived us by imitating a lake; at last we reached the very spot where it was marked to be, and there found but the bed of the lately-dried-up lake. The lake seemed to have been three miles across, but very shallow; doubtless it fills in the early summer, receiving the drainage of some of the southern and of the western portion of the plain. By evaporation it becomes saline, and as the season advances dries up altogether. This wide plain, dry and bare, and exposed at noonday to rays of the sun untempered by thick air, is well calculated to produce mirage, which depends on the differing temperatures (and therefore differing densities) of different horizontal layers of air. The first time I crossed it, a striking and somewhat puzzling mirage prevailed. Eastwards the plain seemed to end in a boundless ocean, in which were strange-shaped islands, some bearing masses of snow; the inverted image of them was reflected from below, and a repetition of the double image beneath that. As one stoops low to the ground the ocean seems to ripple to but a hundred yards from one; sometimes the appearance of water was very distinct to us as we were seated, but disappeared on our rising. From other points the mirage made the plain look like a beautiful lake with steep banks, backed by high snowy mountains.

The area of the plain itself and of the inner slope of the surrounding mountains makes an isolated basin of drainage.

2: Gervis T-3 (no date) 1954 AV1 Kashmir

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under eight thousand feet high, while most of the people live at an elevation of between twelve thousand and fifteen thousand feet, no wonder that few venture from their country, and when they do, have soon to return or die in the denser air of the lower countries. During the days of the summer months it is exhaustingly hot, in winter, freezing cold; the summer nights can also be bitter.

Routes are divided up into so many "marches"; in the old days a march was considered the distance which could be reasonably covered in a day, providing at the end a good camping ground for the night, and usually places where fresh coolies could be employed.

The route from Srinagar to Leh which goes by way of Sonamarg, Dras and Kargil is broken up into sixteen marches, the first portion to Sonamarg being divided up into four, whereas in these days it can easily be done in a day, and providing the weather is good, this also applies to some extent to a few of the other marches laid down for other parts of the journey which is a distance over all of two hundred and forty-two miles. Since it is one of the main trade routes into Kashmir it is not astonishing that the road, when passable, is good; by that I mean good the whole of the way for horses and pack mules, and with a surprising number of quite reasonable rest houses on the way.

The first pass to be traversed after leaving Sonamarg is eleven thousand, three hundred feet high and between Beltal and Matayan. It is usually open for horses from June to December, though we soon discovered that we had been well advised to employ Dras ponymen for that part of the journey; they know the route and the short cuts as well as the diversions to save hard climbing, in addition to being able to forecast accurately the weather in the mountains.

This pass is considered to be very dangerous with sudden storms and avalanches descending upon in it the early part of the year, so that the advice always given is that there must be at least two fine crisp days after such a happening before one attempts a crossing. On the occasion when we went over, our men had refused to move for two days and then insisted on starting from Baltal, the last stage, in the early hours of the

2: Gervis T-3 (no date) 1954 AV1 Kashmir ~~AV1~~
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771 are few. It was the Emperor Asoka, the great missionary-
779 monarch, who between the years 272 and 231 B.C. first sent Buddhist missionaries to Ladakh on goodwill missions, and on their arrival there they built monasteries.

[212] The people of this land claim that ninety per cent of the popu-
181 lation are literate although they are simple and unsophisticated;
533 they are carefree, gay and sociable, the smallest excuse providing
535 for a feast with laughter, dancing and singing, with an opportunity for drinking large quantities of *chang*, which results in general drunkenness. Births, marriages and even deaths are ordinary occasions for feasting and drinking, with singing and dancing girls always a part of the entertainment. Arthur Neve said of them, "They are a contented cheerful race, neither quarrelsome nor revengeful, or rarely so under the influence of *chang*, a sort of barley beer. They are fairly honest and simple-minded, but conspicuously lacking in chastity and cleanliness. From simple and natural marriage customs they are debarred by the restricted nature of the country, and by the intense cold in winter, from ablutions, which they also dispense with in summer by choice."

361 On entering the town one passes through a gateway into the
526 main street, one which is shaded by great poplars on both sides, behind which are the flat-roofed houses with odd rooms piled high on top of each other. In this wide street, as is common in Ladakh, polo used to be played; now there is a special ground for the game by the castle wall. Polo is the national game and is played on small shaggy Ladakh ponies which are fast and on which the rider looks oversized. When a game is in progress in the other towns, the street is cleared, the shops shut, and the onlookers sit on the walls, in windows or on the roof tops. At "important" matches a band blasts furiously, working both players and watchers up to a terrific tension.

[515] The surprising thing is that although the people never wash
[356] and are filthy in their persons, their homes are reasonably clean and tidy, the lanes and streets are swept, and there is no litter or
342 filth lying about. The houses are substantial, with wooden
● 132 shutters to the windows, for throughout the whole land, although it may be unbearably hot during the day, the nights can be bitter: some declare that a bucket of water stood out on some

2: Gervis I-3 (no date) 1954 AV1 Kashmir
W. Tibetans AJ 4

summer nights will have a layer of ice on its surface the next morning. Yet the winter's day can be considerably warmer outside than in. At such times of the year there is often a difference of as much as fifty degrees between the sunny courtyard of a Lamasery and the inside of one of its thick-walled cells. Dr. Arthur Neve speaking of this difference declared it to be as much as ninety degrees at times: having always found his statements to be accurate, I have no reason to question them, for I have little doubt that he went round with a thermometer, which I did not carry.

With practically no rainfall there is very little wood to be had even for cooking, and none for firing, so that the nights are dark except for the moon. One can imagine the chances of a crate of window glass arriving intact under such transport conditions as I have described.

The day following my arrival in Leh I was most fortunate in meeting in the main bazaar a Buddhist priest I had before known in Ceylon, he being one of the brothers belonging to the Temple of the Tooth in Kandy. He was a learned old man who, I then remembered, had once told me that his grandfather had come from "Little Tibet". Now old, he had had the good fortune to be brought to Leh by an equally aged Buddhist merchant of Kandy who, feeling that his end was near, wished, for some inexplicable reason to go to Leh, there to die. The priest who was his great friend, had come with him; the old man had died during the winter months; now the priest was to return alone.

He had been easy to pick out from the others, for as with the Buddhists of Ceylon, he had no head dress and wore saffron-coloured robes. The lamas or monks of Ladakh wear a cloak and shawl of dirty wine colour; they belong to what is known as the red sect; their shaven heads are covered with red, longish shaped hats with ear flaps. Some of them are married. Occasionally one sees a member of the yellow sect; they mostly come from Tibet, are of a much stricter order than the red and more ascetic and learned. They do not marry.

From him, together with one of the head monks of the great monastery, I learnt of the customs of the land; why it is that every one in five or six men one sees about is a monk, and the

3: Imperial Gazetteer G-3 (1889-95) 1909 AV1 Kashmir AV1
W. Tibetans AJ4

Srīvara the lake is called Dala. The cultivation on the lake is peculiar and interesting. Kr 631

Ladākh.—The most westerly province of the high mountainous land spoken of as Tibet is called Ladākh or Ladāg. It is now politically a division of the Kashmīr State, lying between the Himālayas and the Kuenlun mountains, and between Baltistān and Chinese Tibet. The Karakoram range forms the northern boundary as far east as the Karakoram pass. The country is known to educated Tibetans by other names—Mangyāl, Nearis, Māryul. WT 101 131

Ladākh is one of the most elevated regions of the earth, its sparse cultivation ranging from 9,000 to 14,000 feet. The scanty population is found in scattered and secluded valleys, where along the river banks and on alluvial plateaux crops are raised by irrigation. Central Ladākh, which lies in the Indus valley, is the most important division of the country. To the north is Nubra, consisting of the valley of the Nubra river and a portion of the valley of the Shyok. The great floods of the Indus, caused by the descent of glaciers across its stream and that of the Shyok, and the consequent damming back of the Nubra river have caused great destruction to riverain lands, once cultivated but now wastes of granitic sand. Here the fields are fenced to guard the crops from the ponies of traders on their way to Yārkand. The south is the Rupshu country with its great lakes. Rupshu Lake covers an area of 60 to 70 square miles. Tsomoriri is 15 miles in length, and lies at an elevation of 14,900 feet. The lakes are land-locked and brackish. East of Central Ladākh is the lake of Pangkong, and in its neighbourhood crops of beardless barley and peas are raised at an elevation of 14,000 feet. South-west is the country of Zāskār, with a very severe climate chilled by the lofty snow ranges. Physical aspects. WT 133 WT [241] WT [241] WT [232]

The flora of Ladākh is scanty, and timber and fuel are the most pressing wants of the people. The *burtse* (*Eurotia*) is a low-growing bush which gives a fair fuel, and in the high valleys the *dama*, a kind of furze, is burnt. On some hill-sides the pencil cedar (*padam*) occurs; and in occasional ravines the wild willow is found. Arboriculture used to be discountenanced under the Gialpos, on the ground that trees deprived the land of fertility. Botany. WT 137 WT [245]

On the plains up to 17,000 feet wild asses or *kiang* (*Equus hemionus*), antelope (*Pantholops hodgsoni*), wild yak (*Bos grunniens*), ibex (*Capra sibirica*), and several kinds of wild sheep (*Ovis hodgsoni*, *O. vignei*, and *O. nahura*) are found; and Fauna. WT 136

the higher hill slopes up to 19,000 feet contain hares and marmots, and the beautiful snow leopard (Felis uncia) and the lynx (F. lynx). Knight, in Where Three Empires meet, remarks:--

'Not only man, but also all creatures under his domination --horses, sheep, goats, fowls--are diminutive here, whereas the wild animals on the high mountains are of gigantic size.'

Drew counted as many as 300 kiang in a day's march. In outward appearance the kiang is like a mule, brown in colour with white under the belly, a dark stripe down the back, but no cross on the shoulder. One kiang shot by Drew was 54 inches in height. The flesh is rather like beef. They are common on the Changchenmo, and are met with in many parts of Ladakh, where their curiosity often disconcerts sportsmen by alarming game worth shooting. A curious fact in the fauna of Ladakh is the absence of birds in the higher parts of the country. An occasional raven is the only bird to be seen.

Climate. The climate is very dry and healthy. Rainfall is extremely slight, but fine dry flaked snow is frequent, and sometimes the fall is heavy. There is a remarkable absence of thunder and lightning. The air is invigorating, and all travellers notice the extraordinary extremes of cold and heat. In Rupshu the thermometer falls as low as 9° in September. The minimum temperature of the month is 23.5°, and the mean temperature 43°. As Knight remarks:--

'So thin and devoid of moisture is the atmosphere that the variations of temperature are extreme, and rocks exposed to the sun's rays may be too hot to lay the hand upon, at the same time that it is freezing in the shade. To be suffering from heat on one side of one's body, while painfully cold on the other, is no uncommon sensation here.'

History. The history of Ladakh, until its conquest by Raja Gulab Singh in the first half of the nineteenth century, is intimately connected with Tibet, with which country it still holds commercial and religious relations. Stories are told of invasions in the seventeenth century by the neighbouring Baltis, sometimes successful, sometimes repulsed. About the end of the seventeenth century the Ladakhis called in the aid of the governor of Kashmir to repel the Sokpos, a Mughal tribe. Help was promptly given, and the Sokpos were driven out of Ladakh, after which it paid tribute to Kashmir. Prior to annexation by the Dogras, the government of the country was a mild form of monarchy. The ruler was called Gialpo or king, but the real power rested with the minister or Kahlon. The only